Panasonic

KW1M-H
Eco-POWER METER
User's Manual

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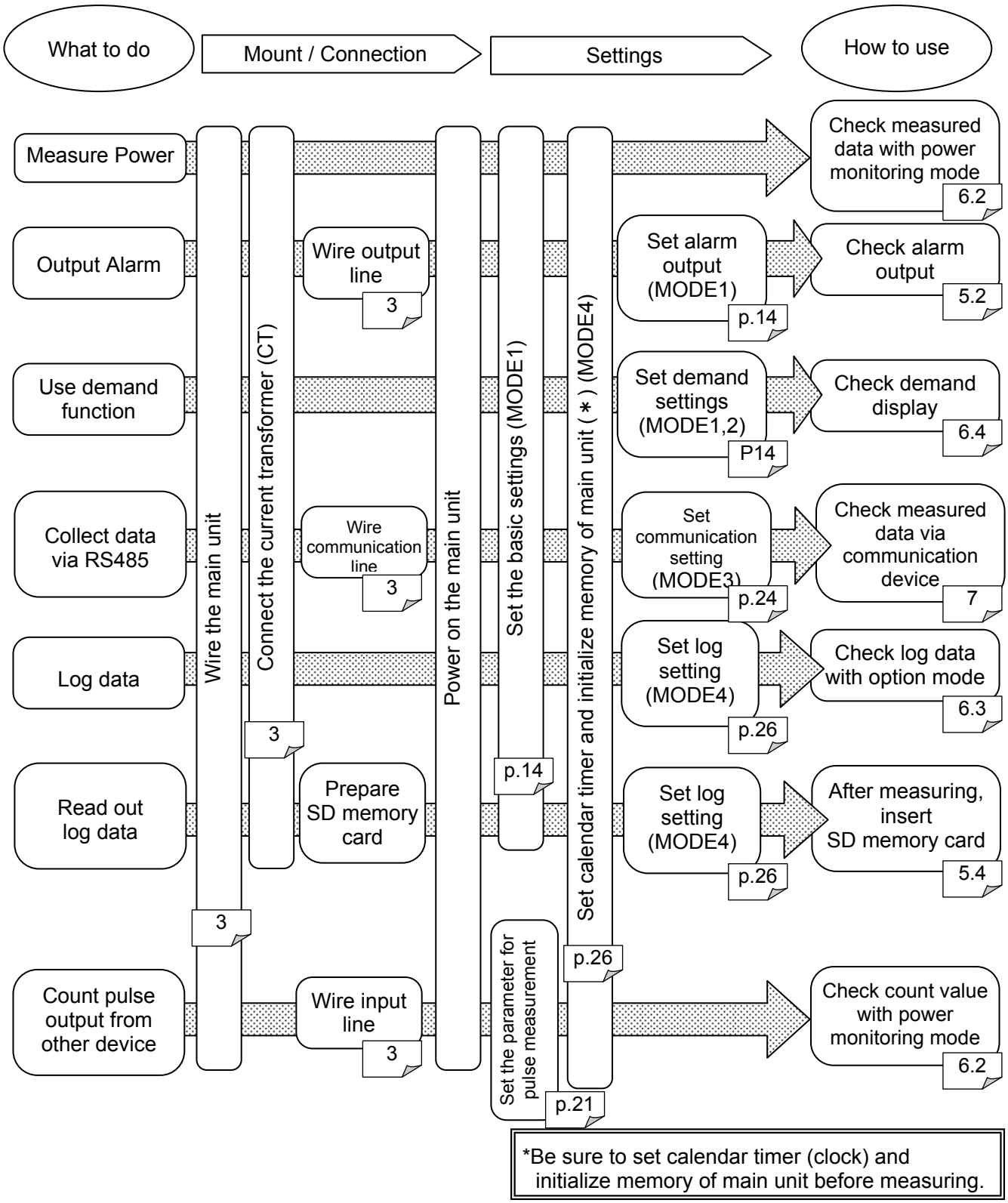
Basic setting to measure by Eco-POWER METER

When wiring the main unit and the current transformer (CT) and setting the basic setting after power on, you can measure the power
The basic setting of MODE1 is necessary to measure.
In order to use the other functions, the settings of the each parameter are necessary.



Cautions for Your Safety

Read the manual carefully before installing, running and maintenance for proper operation.

Before using, master the knowledge of the equipment, safety information and all of other notes.

This manual uses two safety flags to indicate different levels of danger.

⚠ **WARNING**	A handling error could cause serious physical injury to an operator and in the worst case could even be fatal.

- Always take precautions to ensure the overall safety of your system, so that the whole system remains safe in the event of failure of this product or other external factor.
- Do not use this product in areas with inflammable gas. It could lead to an explosion.
- Exposing this product to excessive heat or open flames could cause damage to the lithium battery or other electronic parts.

⚠ **CAUTION**	A handling error could cause serious physical injury to an operator or damage to the equipment.

- To prevent abnormal exothermic heat or smoke generation, use this product at the values less than the maximum of the characteristics and performance that are assured in these specifications.
- Do not dismantle or remodel the product. It could lead to abnormal exothermic heat or smoke generation.
- Do not touch the terminal while turning on electricity. It could lead to an electric shock.
- Use the external devices to function the emergency stop and interlock circuit.
- Connect the wires or connectors securely. The loose connection might cause abnormal exothermic heat or smoke generation.
- Do not allow foreign matters such as liquid, flammable materials, metals to go into the inside of the product. It might cause exothermic heat or smoke generation.
- Do not undertake construction (such as connection and disconnection) while the power supply is on.
- Do not use at secondary side circuit of inverter. It might cause exothermic heat or damage.

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Introduction

Thank you very much indeed for purchasing ‘KW1M-H Eco-POWER METER’.
In this manual, we explain the usage of ‘KW1M-H Eco-POWER METER’ in detail.
Please use it correctly after understanding the content enough.

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Cautions before using

■ Installation environment

◇Do not use the Unit in the following environments.

- ･Where the unit will be exposed to direct sunlight and where the ambient temperature is outside the range of -10 to 50 °C.
- ･Where the ambient humidity is outside the range of 30 to 85 % RH (at 20℃, non-condensing) and where condensation might occur by sudden temperature changes
- ･Where inflammable or corrosive gas might be produced
- ･Where the unit will be exposed to excessive airborne dust or metal particles
- ･Where the unit will be exposed to water, oil or chemicals
- ･Where organic solvents such as benzene, paint thinner, alcohol, or strong alkaline solutions such as ammonia or caustic soda might adhere to the product
- ･Where direct vibration or shock might be transmitted to the product, and where water might wet the product
- ･Where the place near high-voltage cable, high-voltage device, power line, power device.
- ･Where the place near a machinery with transmission function such as amateur radio.
- ･Where the place near a machinery which occurs the big switching serge

◇Please use the Unit according to the specifications described in this manual. Otherwise, it may malfunction or cause fire and an electric shock.

- ･Connect to the power supply in compliance with the rating.
- ･Refer to the wiring diagram to ensure proper wiring for the power supply, input and output.
- ･Do not perform wiring or installation with a live line. It may also lead to circuit burnout or fire by way of the secondary CT side opening.

■ Installation

- ･Installation and wiring must be performed by expert personnel for electrical work or electric piping.
- ･The power supply terminal and voltage input terminal of the main unit is common. Therefore if additional noise effects the power supply line, incorrect measurements may result.
- ･Eco-POWER METER is designed to be used in a control panel.
- ･Do not add an excess power to the display. It might break the inner liquid crystal.

■ As to measurement

- ･If there is some distortion by harmonic or waveform, it may not measure correctly. Please check with the actual system before adopts it.
- ･This can't measure the power that flows reverse such as a regenerative electric power. If you measure a reverse power, it shows '0.00kW' and it doesn't count.
- ･It might not measure an instantaneous current such as an inrush current or an welding machine.
- ･When measuring the below loads, it might not satisfy with the accuracy guarantee.
  Out of rating current, Load with low power factor,
  Load with winding current, Load with ferromagnetic field
- ･Power factor operation is a method assuming balanced load. The error might be big when it measures unbalanced load.

■ Static electricity

- ･Discharge static electricity touching the grounded metal etc. when you touch the unit.
- ･Excessive static electricity might be generated especially in a dry place.

■ Cleaning

- ･Wipe dirt of the main unit with soft cloth etc. When thinner is used, the unit might deform or be discolored.

■ Power supply

- Connect a breaker to the voltage input part for safety reasons and to protect the device.
  The breaker that connects to the voltage input part must arrange at the position easily reached, and display shows it is the breaker of the equipment.
- Do not turn on the power supply or input until all wiring is completed.

■ Before power on

Please note the following points when turning on power at the first time.

- Confirm there are neither wiring rubbish nor especially an electrical conduction when installed.
- Confirm neither the power supply wiring, the I/O wiring nor the power-supply voltage are wrong.
- Tighten the installation screw and the terminal screw surely.
- Use an electric wire applicable to the rated current.

Chapter 1 Unit's Features and Structure

KW1M-H Eco-POWER METER is the suitable size wattmeter for installing in a control board.
It measures electrical power, voltage, current and so on using AC voltage and AC current input.
It also works ad an hour meter, which is measured power-on or power-off time.

1.1 Unit's Name and Model Numbers

1.1.1 Main unit

Product name	KW1M-H Eco-POWER METER SD card type
Model No.	AKW1121
Log function	Available
Demand function *	Available
Phase and Wire system	・Single-phase two-wire ・Single-phase three-wire ・Three-phase three-wire ・Three-phase four-wire
Power supply	100-240V AC 50/60Hz
Measured voltage input	・400VAC ・100/200VAC
Measured current input	50A / 100A / 250A / 400A / 600A
Current transformer	Dedicated CT type
Terminal type	Screw Terminal (M3 + / - screw)

* Demand function by pulse input is available for Ver.1.20 or more.

1.1.2 Option

Dedicated Current Transformer (CT) Clamp-on type

Product name	Rated primary current	Model No
Dedicated current transformer for 5A/50A	5A / 50A	AKW4801C
Dedicated current transformer for 100A	100A	AKW4802C
Dedicated current transformer for 250A	250A	AKW4803C
Dedicated current transformer for 400A	400A	AKW4804C
Dedicated current transformer for 600A	600A	AKW4808C

Dedicated Current Transformer (CT) Through type

Product name	Rated primary current	Model No
Dedicated current transformer for 50A/100A	50A / 100A	AKW4506C
Dedicated current transformer for 250A/400A	250A / 400A	AKW4507C
Dedicated current transformer for 600A	600A	AKW4508C

Others

Product name	Model No
Mounting rail	AT8-DLA1
Fastening plate	ATA4806
Battery *1) Required to back up memory and calendar	AFPG804
Mounting frame	AKW1822
Extension cable for CT 3m	AKW4703
Extension cable for CT 5m	AKW4705

*1) Included with the product when shipped.

1.1.3 Tool

Product name	Functions	Model No
Data collection software KW Monitor	・Monitoring and logging the measured values.	Download from our website. Free of charge
Power display tool KW View	It makes graph by using data from Eco-POWER METER	Download from our website. Free of charge

Note) Members registration is required to download.

1.2 Measurement items

Item		Unit	Data range (Display)
Integrated electric power (Active)		kWh/ MWh	0.00 to 9999.99MWh (9-digit display) 0.00 to 9999999.99kWh
Instantaneous electric power (Active)		kW	0.00 to 9999.99
Current	R-current	A	0.0 to 6000.0
	S-current		
	T-current		
Voltage	R(RS)-voltage	V	0.0 to 9999.9
	S(RT)-voltage		
	T(TS)-voltage		
Electricity charge *1			0.00 to 999999
Conversion value	Carbon dioxide	kg-CO_2	0.00 to 999999
Power Factor			0.00 to 1.00 (Identify leading phase(－) and lagging phase) (Within the range of phase angle θ=-90 to 90 degree)
Frequency	Hz		47.5 to 63.0
Hour meter	ON-time	hour	0.0 to 99999.9
	OFF-time		
Pulse counter			0 to 999999
Integrated electric power converted by pulse		kWh/ MWh	0.000kWh to 9999.99MWh
Demand *2	Present demand	kW	0.00 to 9999.99
	Estimated demand	kW	0.00 to 9999.99
	Ratio of estimated demand	%	0.0 to 9999.9

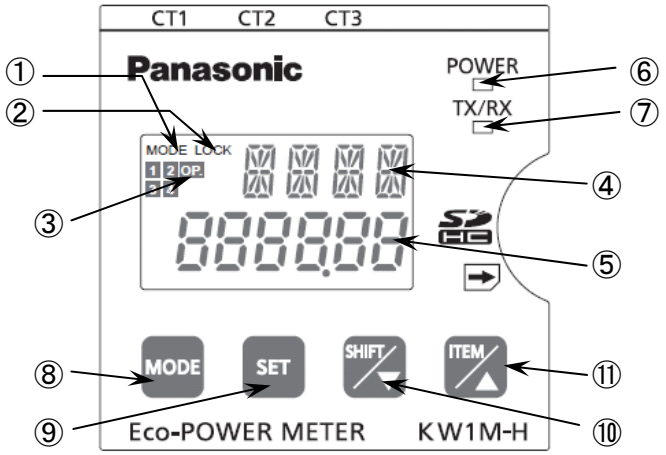
*1 Eco-POWER METER is designed chiefly to manage saving energy.
It is neither intended nor can it be legally used for billing.

*2 Please use this demand function as your standard. The demand value calculated with this function is not guaranteed.

Chapter 2 Parts Name and Working

2.1 Parts Names

①MODE indicator	Lighting when mode setting
②LOCK indicator	Lighting while in lock mode
③OP. output indicator	Lighting when pulse output
④Mode display	Display mode in setting and measurement item with 16-seg
⑤Display each value	With 7-seg ・Display each measured value ・Display each setting value
⑥POWER indicator	Lighting while power on
⑦TX/RX indicator	Blinking while communication
⑧<MODE> key	
⑨<SET> key	
⑩<SHIFT / ▽> key	
⑪<ITEM / △> key	



2.2 Key's Functions

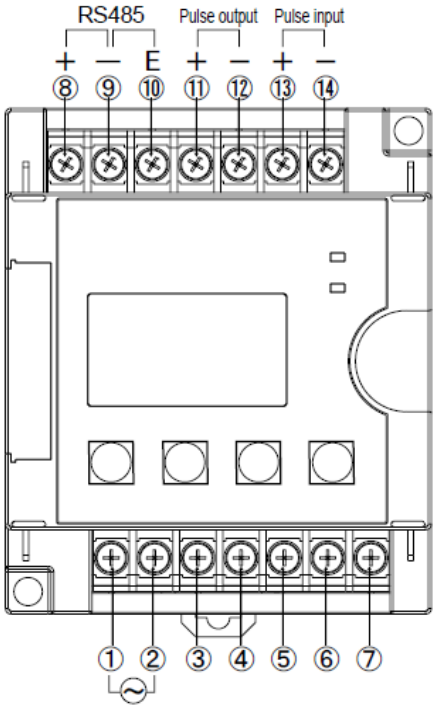
Key	Functions
<MODE>	・Use to shift setting mode
<SET>	・Use to set each value entered ・Reset stand-by alarm while output the alarm (only available while output the stand-by alarm)
<SET> (continuous press 3-sec)	・All keys locked ・Release lock mode while in lock mode
<SHIFT/▽>	・To select measured value display (While monitoring) ・To select setting value (While setting mode)
<ITEM/△>	・To select measured value display (While monitoring) ・To select setting value (While setting mode)
<SET>+<MODE>	・To reset the measured value
<SET>+<ITEM/△>	・To shift power monitoring mode and option mode
<SET>+<SHIFT/▽>	・To shift power monitoring mode and simple demand mode

Chapter 3 Wiring

Be sure to wire correctly according to the terminal arrangement and wiring diagrams.
After completing wiring, be sure to attach the terminal cover for safety reasons.

3.1 Terminal arrangement

No.	Function	
①	L	Power supply
②	N	
③	N.C.	
④	P1	Measured voltage input
⑤	P0	
⑥	P2	
⑦	P3	
⑧	+	RS485
⑨	−	
⑩	E	
⑪	+	Pulse output
⑫	−	
⑬	+	Pulse input
⑭	−	

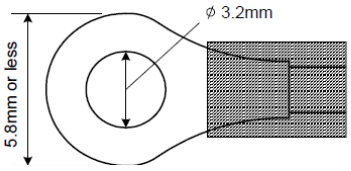


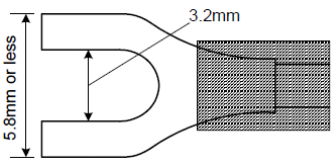
⚠ The input voltage to each terminal is as follows.

Terminal	Phase and wire	Terminal	Input voltage	
Operating power supply	Single-phase, two-wire	①−②	100-240VAC (100 – 240V～)	(Line voltage)
Measured voltage input	Single-phase, two-wire	④−⑤	0-440VAC (0-440V～)	(Line voltage)
	Single-phase, three-wire	④−⑤−⑥	0-220VAC (0-220V～:3W)	(Phase voltage)
	Three-phase, three-wire	④−⑤−⑥	0-440VAC (0-440V 3～)	(Line voltage)
	Three-phase, four-wire	④−⑤−⑥−⑦	0-254VAC (0-254V 3N～)	(Phase voltage)

Caution for Wiring

1) Terminal fastening torque should be 0.5 to 0.6N·m. In case of using a crimping terminal, use it with insulating sleeve applicable to M3 screw.
2) This has no built-in power switch, circuit breaker for power supply part. To protect the device, it is necessary to install power switch and circuit breaker in the power supply circuit.
   And this has no built-in power switch, circuit breaker or fuse for measured voltage input parts.
   Therefore it is necessary to install them in the circuit near this unit.
3) We recommend a wire with the cross section of 0.75 to 1.25mm^2 for power supply line and measured voltage input line.
4) Use flame-resistant cable for each wiring.





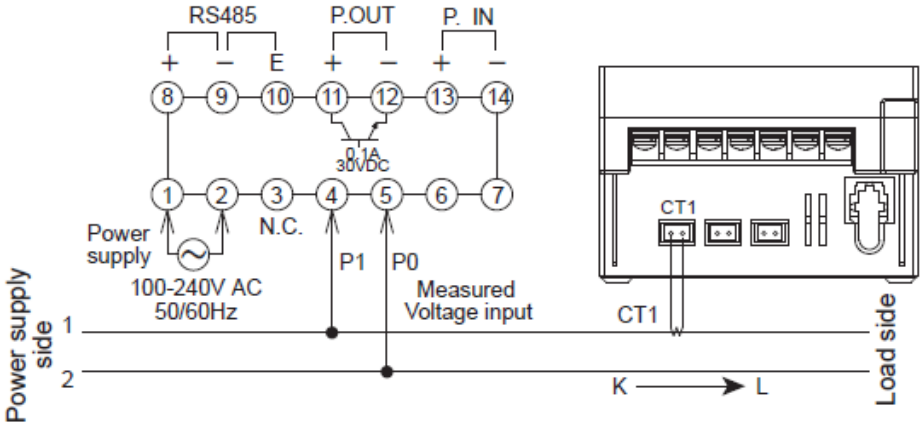
3.2 Wiring Diagrams

Please connect a breaker (3 to 15A) to the voltage input part for safety reasons and to protect the device. Grounding the secondary side of VT (Voltage transformer) and CT (Current transformer) is not necessary with low-voltage circuit.

◆When measuring a load with rated input voltage (100-200V system/ 400V system)

Single-phase two-wire system

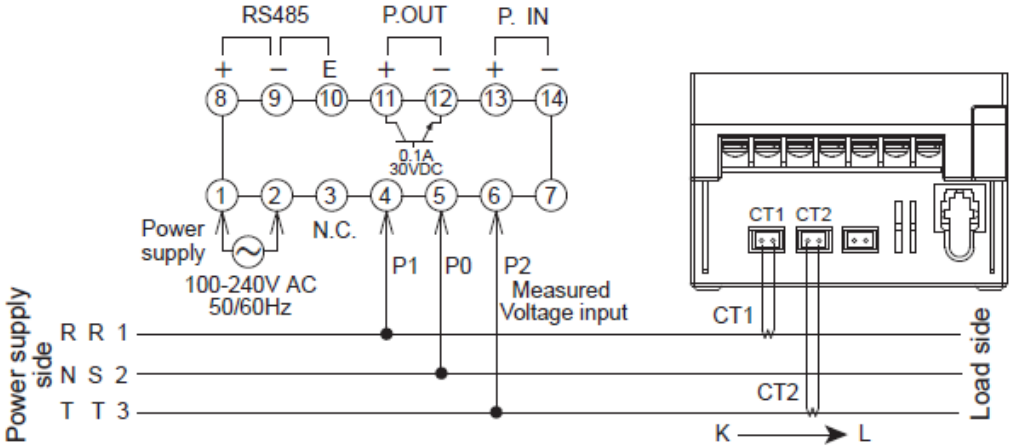
*One current transformer (CT) is required.



Do not wire ⑥ ⑦ terminals. They are connected internal.

Single-phase three-wire / Three-phase three-wire system

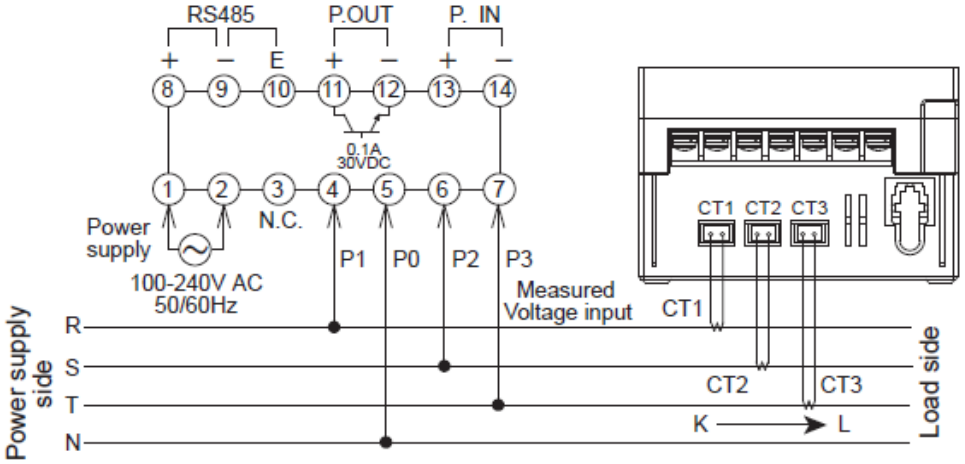
*Two current transformers are required.



Do not wire ⑦ terminal. It is connected internal.

Three-phase four-wire system

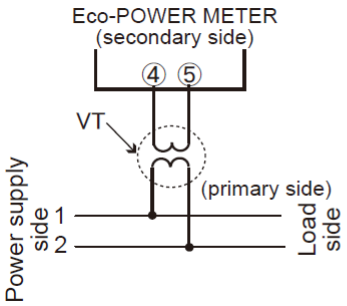
*Three current transformers are required.



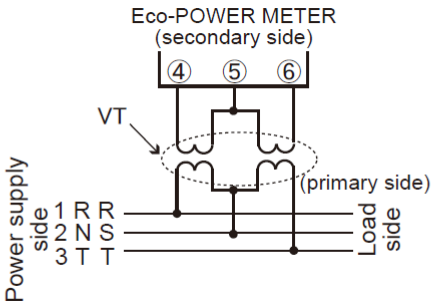
◆When measuring a load with exceed input voltage

Voltage transformer (VT) is needed when you measure a load with over rated input voltage (440V).
Use VT, those secondary rating is 110V.
Grounding the secondary side of VT and CT is not necessary with low-voltage circuit.

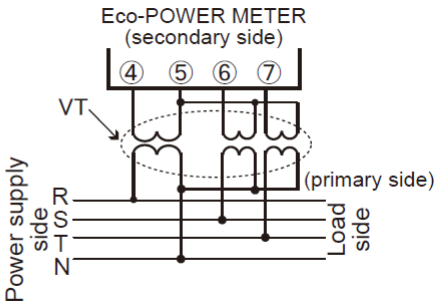
Single-phase two-wire system



Single-phase, three-wire system
Three-phase, three-wire system



Three-phase, four-wire system



◆Using the clock correction function by frequency of the measured voltage

It corrects the clock by using the measured voltage frequency input to P1-P0 as a reference frequency.
When P1-P0 terminals are not connected or it set OFF for clock correction function, it doesn't correct the clock.

3.3 How to attach the Current Transformer (CT)

- One current transformer (CT) is needed to measure 1P2W system. Two CTs are needed to measure a 1P3W/3P3W system. Three CTs are needed to measure a 3P4W system. Using all CT should be the same.
- Check beforehand that the thickness of the electric wire is smaller than the through-hole of the CT.
- When connecting CT, connect the secondary side to the terminal of the main unit first, and after that wire the primary side to a load electric wire.
  Incorrect order might cause an electric shock or break CT.
- The CT has polarity. Wire correctly according to the K and L marks.
  Wrong direction can't measure correctly.
- When closing clamp-on type CT, check that there is no foreign materials on the divided face. And make sure it is closed securely once the wire is in place; **if not the measurement value will be not accurate.**
- When CT's cable is extended, it is possible to extend up to about 10m with the cable of AWG#22 or more cross section under the environment without noise at all. Please use the thick cable as much as possible. *Please check beforehand with the actual system in case of extending the cable.
- If there is some distortion by harmonic or waveform, it may not measure correctly. Please check with the actual system before adopting it.
- Separate the wiring (strong electric part) of the measured voltage input terminal (operating power supply terminal) from the CT cable. It may not satisfy the accuracy due to noise.

◇To connect CT with secondary side current 5A

How to set for measuring by combination with CT (secondary side current 5A)

(1) Select 5A at CT type setting mode (CT-T).

(2) Set the primary current of measured CT (secondary side current 5A) at primary side current of CT setting mode (CT-1).

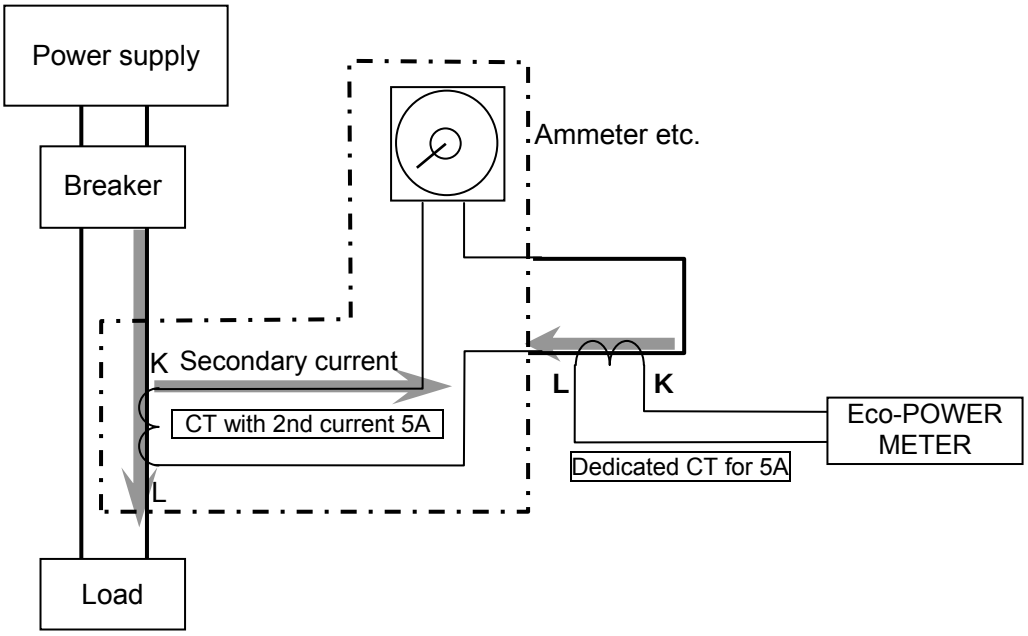
< ex > If the measured CT is 400A/5A, set to'400'.

(3) Clamp the dedicated CT for 5A, which is connected to the main unit first, to secondary side of the CT (secondary side current 5A). CT direction (K→L) should be set for the commercial CT direction.

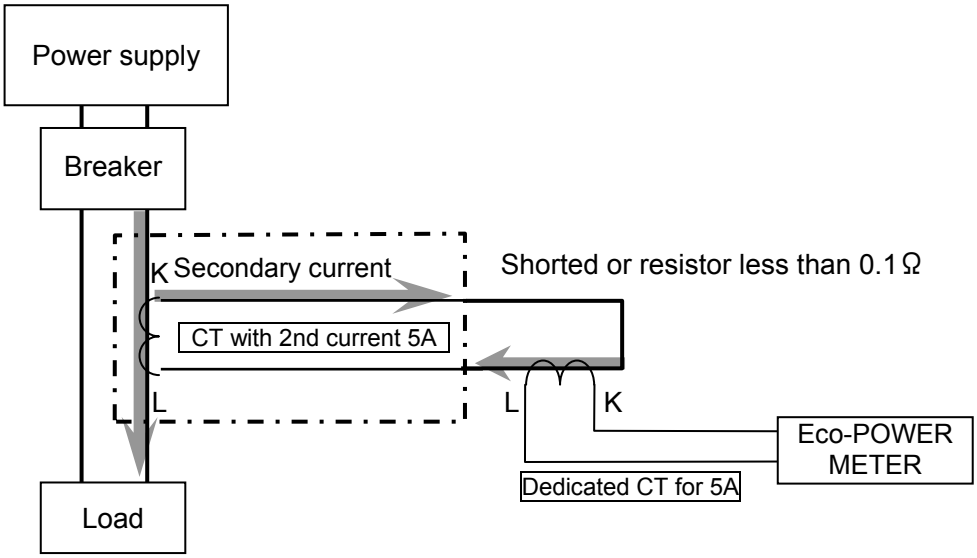
***Set the CT (secondary side current 5A) and the dedicated CT for 5A approximately 1m apart. If the two CTs are set too close each other, it may not measure accurately due to magnetic field interference.**

(Connection example)

With Ammeter etc.



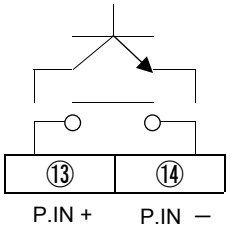
Without Ammeter



3.4 For input connection

・Contact input

Use highly reliable metal plated contacts. Since the contact's bounce time leads directly to error in the count value, use contacts with as short a bounce time as possible. In general, select 30Hz for max. counting speed.



・Non-contact input (Transistor input)

Connect with an open collector. Use the transistor with the following specifications. V_{CEO}=20V min. I_C=20mA min. I_{CBO}=6 μ A max

Use transistors with a residual voltage of less than 1.5V when the transistor is ON.

∗ Short-circuit impedance should be less than 1kΩ.

(When the impedance is 0Ω, drain current is approx. 7mA.)

Open-circuit impedance should be more than 100kΩ.

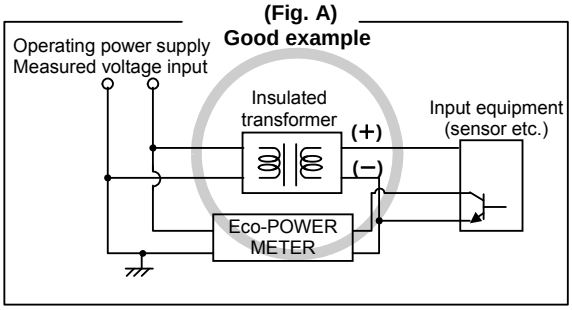
・Input wiring

Please wire up to 10m by using a shielded wire or a metallic electric wire tube individually. If it is long, it may not work correctly due to floating capacitance of wire.

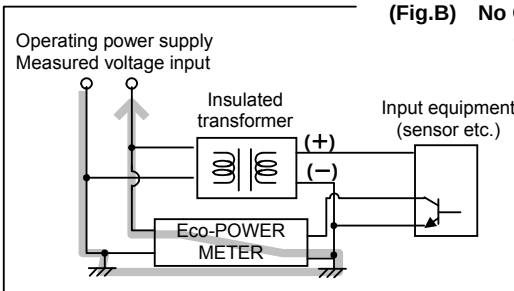
(Note)

Operating power supply input part and measured voltage input are not insulated to pulse input parts. So the input equipment must have the power supply transformer in which the secondary side is not grounded with the primary and secondary sides insulated, in order to prevent interference of the power supply circuit when connecting the external input circuit. Be sure not to use an auto-transformer.

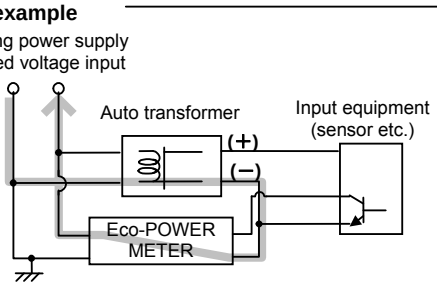
(Fig. A)
Good example



(Fig.B) No Good example



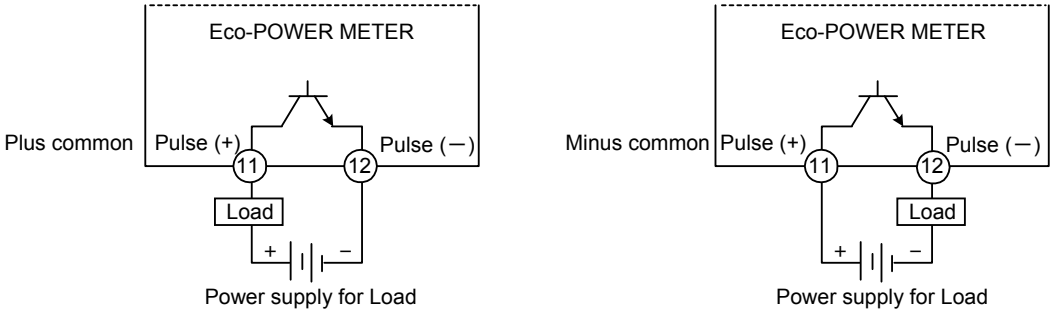
Do not ground the secondary side.



Do not use an auto-transformer.

3.5 For Output connection

・Since the transistor output is insulated from the internal circuit by a photo-coupler, it can be used both as a plus common and minus common.



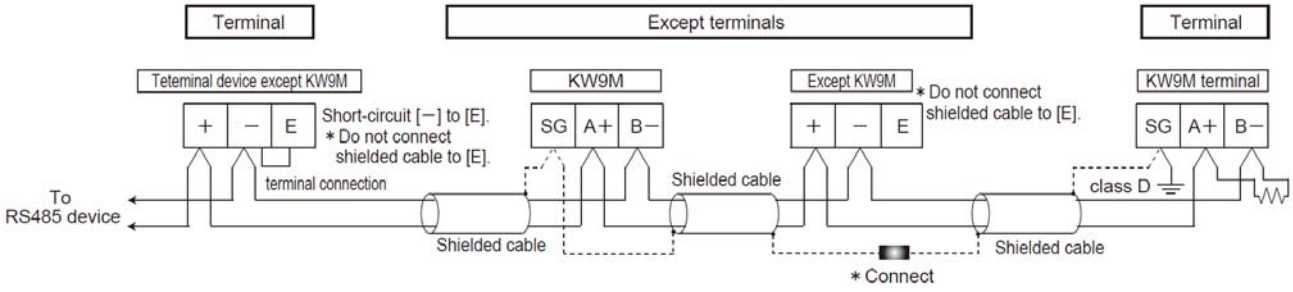
・Wire up to 100m for output connection.
If it is long, it may not work correctly due to floating capacitance of wire.

3.6 RS485 Communication

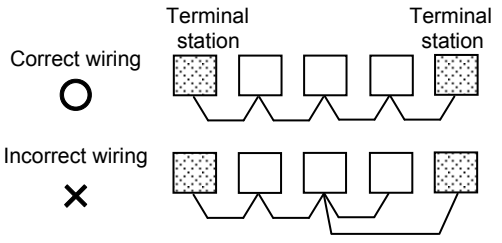
・When using shielded cable for the RS485 transmission line, ground one end.
Use a class D dedicated earth for grounding. Do not share a ground with other earth lines. (Fig.1)
・Be sure to connect with daisy chain the RS485 transmission line between each unit.
Do not use a splitter. (Fig.2)
・With a terminal station, RS485 (E) (No.10) and RS485 (-) (No.9) should be shorted.

*E terminal is not SG (signal ground) terminal. Do not ground shielded cable.

(Fig.1)



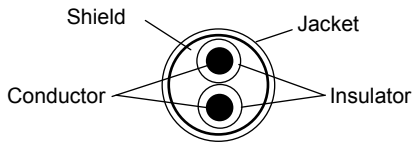
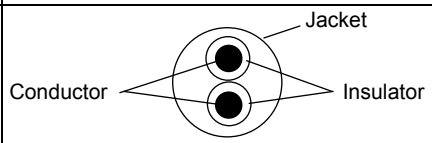
(Fig.2)



Recommended Cable

Use the transmission cables shown below for Eco-POWER METER RS485 communication system.

Cable	Conductor		Insulator		Cable diameter	Applicable cable
	Size	Resistance (at 20℃)	Material	Thickness		
Twisted-pair with shield	1.25 mm^2 (AWG16) or more	Max.16.8Ω/km	Polyethylene	Max. 0.5 mm	Approx. 8.5 mm	HITACHI KPEV-S 1.25 mm^2 × 1P Belden Inc. 9860
	0.5 mm^2 (AWG20) or more	Max.33.4Ω/km	Polyethylene	Max. 0.5 mm	Approx. 7.8 mm	HITACHI KPEV-S 0.5 mm^2 × 1P Belden Inc. 9207
VCTF	0.75 mm^2 (AWG18) or more	Max.25.1Ω/km	PVC	Max. 0.6 mm	Approx. 6.6 mm	VCTF 0.75 mm^2 × 2C (JIS)

Cable	Section
Twisted-pair with shield	
VCTF	

Notes
1) Use shielded type twist cables.
2) Use only one type of the transmission cables.
2) Do not mix different types of the cables.
3) Use twist pair cables under a bad noise environment.

3.7 Low Voltage Directive

When using in the application confirming to EN61010-1/IEC61010-1, make sure to satisfy the following conditions.

(1) Pulse output part secure only basic insulation. In order to secure reinforced (double) insulation demanded by EN 61010-1/ IEC61010-1, secure basic insulation or more with load side and reinforced (double) insulation with communication system side.
(2) Provide the voltage input part with an EN60947-1 or EN60947-3 compliant circuit breaker.
The breaker that connects to the voltage input part must arrange at the position easily reached, and display shows it is the breaker of the equipment.
(3) Use a wire with basic insulation or more for a wire cramped (or connected) CT.

【Environmental conditions】

- Overvoltage category Ⅱ, Pollution degree 2
- Indoor use
- An ambient temperature of –10 to 50℃
- An ambient non-condensing humidity of 35 to 85%RH (at 20℃)
- Altitude of 2000m or less

【Mount the product in a place with】

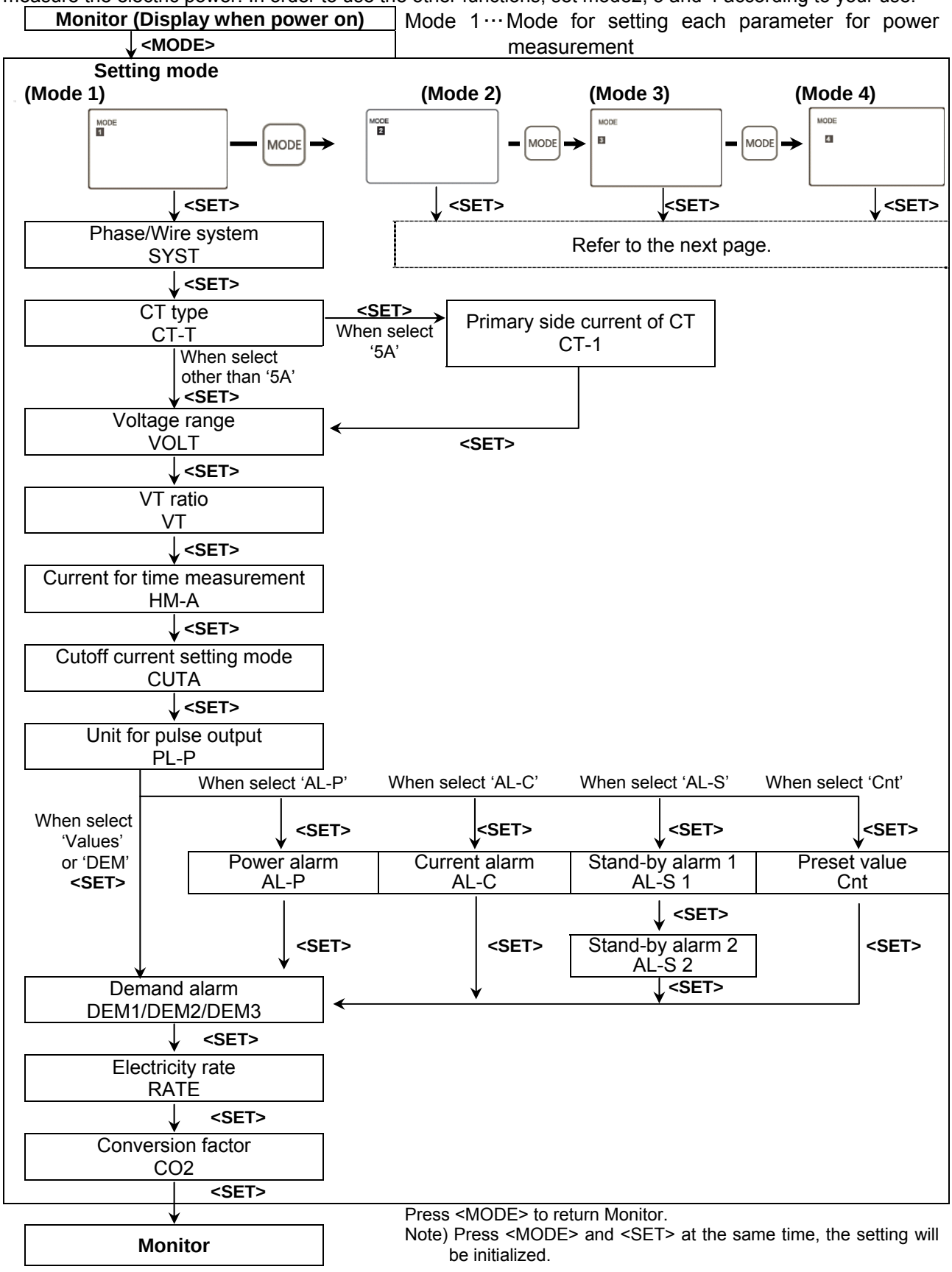
- A minimum of dust, and an absence of corrosive gases
- No flammable, explosive gasses
- Few mechanical vibrations or shocks
- No exposure to direct sunlight
- No large capacity electromagnetic switches or cables through which large current is flowing

Chapter 4 Settings

4.1 Operation procedure

【Basic setting to measure】

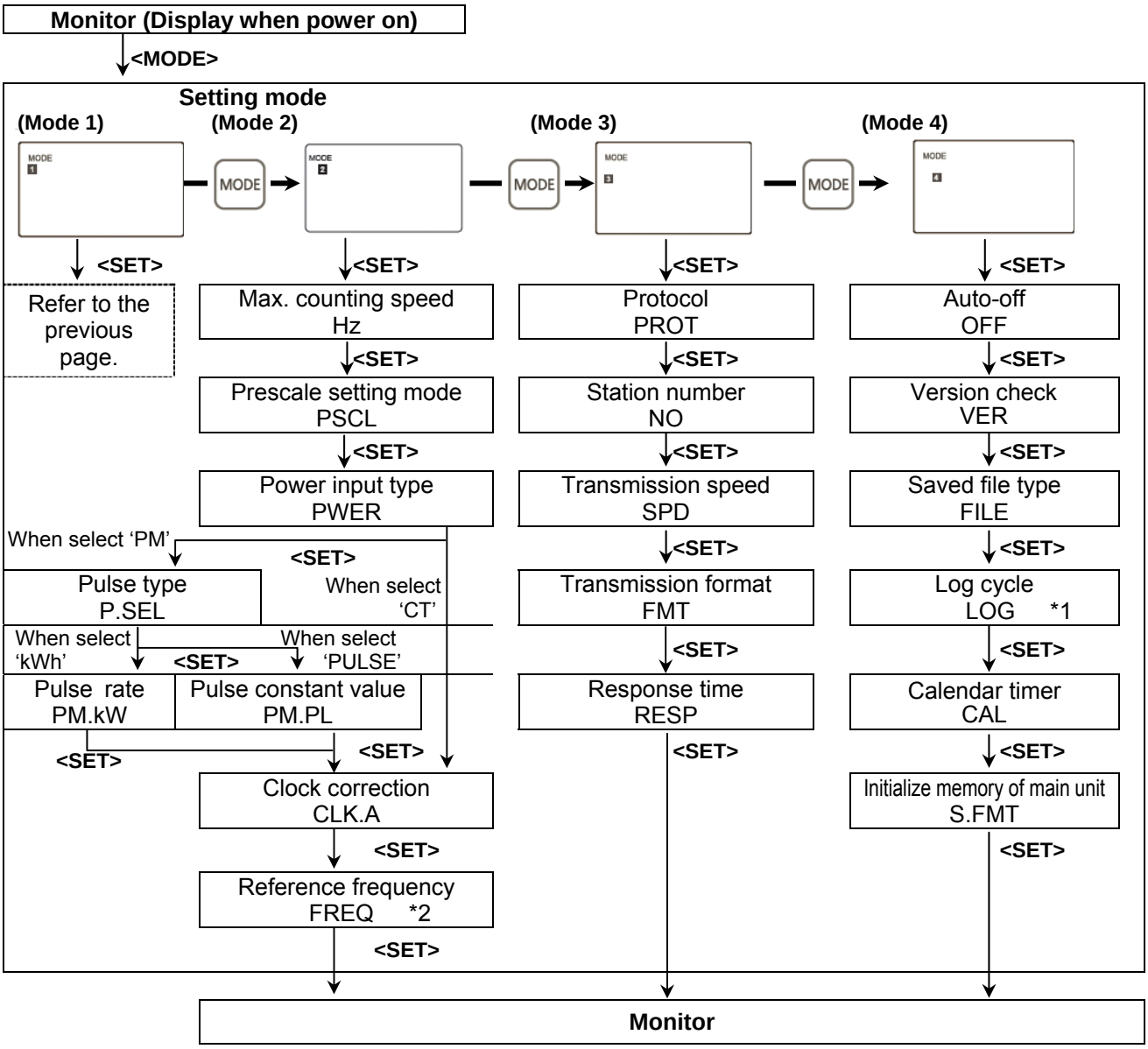
When wiring Eco-POWER METER and CT and setting mode 1 after power on, Eco-POWER Meter can measure the electric power. In order to use the other functions, set mode2, 3 and 4 according to your use.



Press <MODE> to return Monitor.

Note) Press <MODE> and <SET> at the same time, the setting will be initialized.

Mode 2…Mode for setting of each parameter for pulse measurement
Mode 3…Mode for setting of each parameter for serial communication
Mode 4…Mode for setting of each parameter for optional function



*1 Log cycle setting mode is only when 'ON' is selected for type 3 on Save file type selection mode.
*2 Reference frequency setting mode is only when 'MANUAL' is selected on clock correction setting mode.

Press <MODE> to return Monitor.
Note) Press <MODE> and <SET> at the same time, the setting will be initialized.

◆Initial value list

Mode 1		Mode 2	
Item	Initial value	Item	Initial value
Phase/Wire system	1P2W	Max. counting speed	2000
CT type	50		
Primary side current of CT	5	Prescale	1.000
Voltage range	400	Power input type	CT
VT	1.00	Pulse type	kWh
Current for time measurement	1.0	Pulse rate	1.000
Cutoff current	1.0	Pulse constant value	50000
Unit for pulse output	0.001		
Power alarm	9999.99	Clock correction	AUTO
Current alarm	100.0	Reference frequency	50.0
Stand-by alarm 1	100.0	Mode 3	
Stand-by alarm 2	0	Item	Initial value
Preset value	0	Protocol	MEWTOCOL
Demand alarm 1	0.00	Station number	1
Demand alarm 2	0	Transmission speed	19200
Demand alarm 3	10	Transmission format	8bit-o
Electricity rate	10.00		
Conversion value	0.410	Response time	1

Mode 4	
Item	Initial value
Auto-off	0
Calendar timer	2000 Jan. 1 00:00:00:00
Initialize memory of main unit	OFF
Saved file type 1	ON
Saved file type 2	ON
Saved file type 3	ON
Log cycle	60

4.2 Setting Mode Explanation

■The value with under line is initial setting among each setting value. ☆Set before measurement.
Press <MODE> and <SET> at a time, the setting will be initialized.

4.2.1 MODE1 (Mode for setting each parameter for power measurement.)

Phase/Wire system setting mode SYST

Mode defines phase and wire system to measure.

・Select from Single-phase 2-wire / Single-phase 3-wire / Three-phase 3-wire / Three-phase 4-wire.
Select the system of the measured load.

CT type setting mode CT-T

Mode defines input current type of the dedicated CT.

・Select from the type of 5A/50A/100A/250A/400A/600A.
・When the secondary current of CT is 5A, select '5A'.

Primary side current of CT setting mode CT-1

*Only when '5A' is selected on CT type setting mode.

Mode defines primary side current when measuring by combination with existing CT, its secondary current of 5A.

It is possible to use as the second step for combination with existing CT by selecting '5A' in the CT type setting mode. In this case, it is necessary to set the primary side current.

・Primary side current of the existing CT can be set the range of 1 to 4000 (Initial 5).
・When connecting 5ACT directly and measure with 5A range, set to '5'.
ex) If primary current of measured existing CT is 400A(secondary side is 5A), set to '400'.

Voltage range setting mode VOLT

Mode defines voltage range of Eco-Power Meter.

・Select from 400/200.
・When it measures load of 400V system, select '400'.
When it measures load of 100/200V system, select '200'.

*In case measuring the load of 100/200V system with selecting '400', the resolution will be down.
Select the correct voltage range.

VT setting mode VT

Mode defines voltage input method to the main unit, input voltage directly or uses a voltage transformer (VT) (over 440V system).

・It can be set the range of 1.00 to 99.99.
'1.00' should be set when voltage input directly without connecting VT.
'1.01 to 99.99' should be set when VT is used to input voltage.

Current for time measurement setting mode HM-A

Mode defines for time measured current. It measures ON-time and OFF-time by setting value.

・It can be set the range of 1.0% to 100.0%F.S.
ex) When 10.0 is set, the current exceeds 10.0%F.S is measured as ON-time, the current under 10.0%F.S is measured as OFF-time.
*Measured current is the current of CT1.

Cutoff current setting mode CUTA

Mode defines load current that does not measure (Cutoff current).

Use to avoid miss-measurement by wiring or induction noise at no-load.

0.00kW is displayed for instantaneous electric power, 0.0A is displayed for current. Integrated electric power is not added.

・It can be set the range of 1.0% to 50.0%.
ex) When set to 10.0, current (=power) under 10.0%F.S is not added.

Unit for pulse output setting mode PL-P

Mode defines unit used for pulse output. It defines the unit of integrated electric power for 1-pulse output.

・Select from 0.001/0.01/0.1/1/10/100kWh /AL-P/AL-C/AL-S/Cnt/DEM.

When one of the '0.001/0.01/0.1/1/10/100' [kWh] is set, one pulse is output at reaching the setting value.

When 'AL-P' is set, alarm is output at the time when instantaneous electric power is over the setting value.

When 'AL-C' is set, alarm is output at the time when current is over the setting value.

When 'AL-S' is set, alarm is output at the time when current is under the setting value and it passes the setting time.

When 'Cnt' is set, it output at the time when count value reaches preset value set by preset value setting mode.

When 'DEM' is set, it output at the time when demand value is satisfied the setting conditions.

Power alarm setting mode AL-P

*Only when 'AL-P' is selected on unit for pulse output setting mode.

Mode defines instantaneous electric power used for alarm output.

・It is set the range of 0.00 to 9999.99kW.

Current alarm setting mode AL-C

*Only when 'AL-C' is selected on unit for pulse output setting mode.

Mode defines the ratio of current used for alarm output. (Ratio for the rated current)

・It is set the range of 1.0 to 100.0%.

Stand-by alarm setting mode 1 AL-S1

*Only when 'AL-S' is selected on unit for pulse output setting mode.

Mode defines the ratio of current used for threshold value to judge stand-by power. (Ratio for the rated current)

・It is set the range of 1.0 to 100.0%.

Stand-by alarm setting mode 2 AL-S2

*Only when 'AL-S' is selected on unit for pulse output setting mode.

Mode defines the time used for threshold value to judge stand-by power.

・It is set the range of 0 to 9999min.

When '0' is set, alarm is always output at the time when judging the stand-by power.

When '1 to 9999' is set, alarm is output at the time when passing the setting time with the stand-by power.

The alarm can be reset by pressing <SET> with the instantaneous electric power display. After reset the alarm, start to monitor the stand-by power again.

Preset value setting mode Cnt

*Only when 'Cnt' is selected on unit for pulse output setting mode.

Mode defines count value used for output.

・It is set the range of 0(0.000) to 999999(999.999).

*The range differs according to the pre-scale set by pre-scale setting mode.

Demand alarm setting mode 1 DEM1

Mode defines the demand target value.

・It is set the range of 0.00 to 9999.99kW.

Demand alarm setting mode 2 DEM2

Mode defines the hysteresis to use for decide alarm off timing.
It can avoid frequent alarm output ON/OFF near a demand target value. (Refer to 5.5)

・It is set the range of 0 to 100%.

Demand alarm setting mode3 DEM3

Mode defines the time to start demand monitoring.

・It is set the range of 1 to 30 min. (Initial 10 minutes)

Ex.) When '10' is set, alarm output or alarm indication 'd' is not occurred after 10 minutes from the demand span started. When '30' is set, it doesn't output alarm and it doesn't indicate alarm.

*In case of that 'DEM1' is set to 0.00kW, it doesn't output alarm and it doesn't indicate alarm.
*When 'DEM' is set with unit for pulse output setting mode, it outputs if all conditions DEM1,2 and 3 are satisfied. And it indicates 'd' on the bottom line of the display regardless the setting of unit for pulse output setting mode. (Refer to 5.5)

Electricity charge setting mode RATE

Mode defines electricity charge ratio used as a standard per 1kWh.

・It can be set the range of 0.00 to 99.99 /1kWh. (Initial 10.00)

Conversion factor setting mode CO2

Mode defines conversion factor of carbon dioxide used as a standard per 1kWh.

・It can be set the range of 0.000 to 9.999/1kWh. (Initial 0.410)

Mode1 Setting flow chart

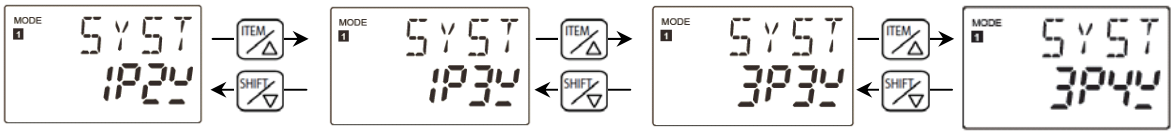
Monitor

↓ **<MODE> (MODE 1 Lighting)**

↓ **<SET>**

Phase/Wire system setting mode

Press <ITEM/△><SHIFT/▽> to change Single-phase 2-wire ⇔ Single-phase 3-wire ⇔ Three-phase 3-wire ⇔ Three-phase 4-wire.

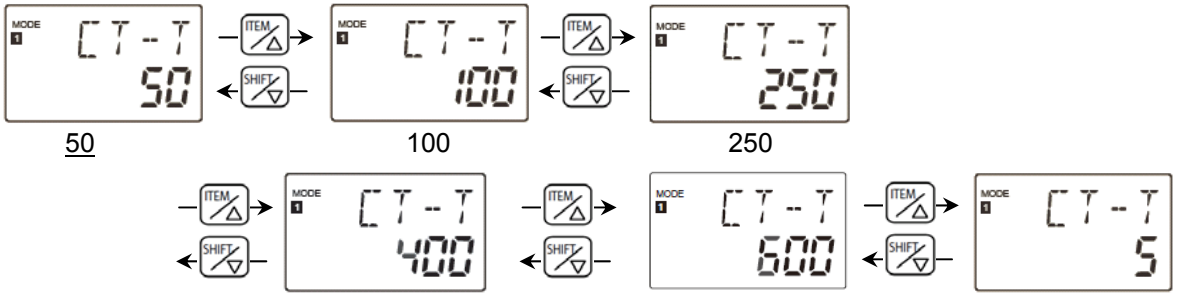


1P2W 1P3W 3P3W 3P4W

↓ **<SET>**

CT type setting mode

Press <ITEM/△><SHIFT/▽> to change 50 ⇔ 100 ⇔ 250 ⇔ 400 ⇔ 600 ⇔ 5.



50 100 250

400 600 5

↓ **<SET>**

Primary side current of CT setting mode *It is only when '5A' is selected on CT type setting mode.

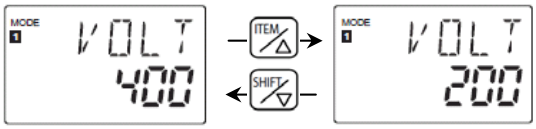
Set primary side current of CT using <ITEM/△><SHIFT/▽>.
If measured CT is 100A/5A, set to 100. If 5A is measured, set to 5.

(1 to 4000, Initial 5)

↓ **<SET>**

Voltage range setting mode

Press <ITEM/△><SHIFT/▽> to change 400V ⇔ 200V.

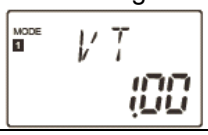


400V 200V

↓ **<SET>**

VT ratio setting mode

Set VT ratio using <ITEM/△><SHIFT/▽>. If the VT is 440/110, set to '4.00'.

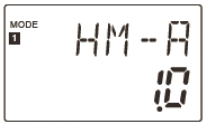


(1.00 to 99.99)

↓ **<SET>**

Current for time measurement setting mode

Set ratio of current for time measurement using <ITEM/△> <SHIFT/▽>.
If you measure the current over 50.0%F.S, set to '50.0'.



(1.0 to 100.0)

<SET>

Cutoff current setting mode

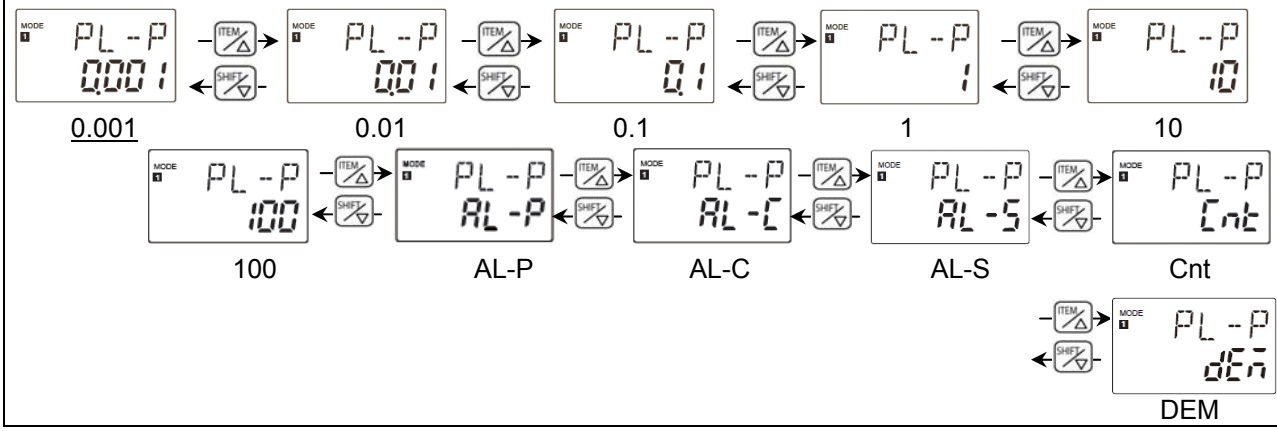
Set cutoff current ratio using <ITEM/△> <SHIFT/▽>.
If you don't measure the current under 10.0%F.S, set to '10.0'.

(1.0 to 50.0)

<SET>

Unit for pulse output setting mode

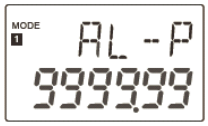
Press <ITEM/△><SHIFT/▽> to change 0.001 ⇔ 0.01⇔ 0.1⇔ 1 ⇔ 10 ⇔ 100 ⇔AL-P (Power alarm)⇔ AL-C(Current alarm)⇔AL-S (Stand-by alarm)⇔Cnt (Count output)⇔DEM (Demand alarm)



<SET>

Power alarm setting mode *It is only when 'AL-P' is selected on unit for pulse output setting mode.

Set power for alarm using <ITEM/△><SHIFT/▽>.

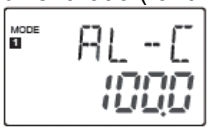


(0.00 to 9999.99)

<SET>

Current alarm setting mode *It is only when 'AL-C' is selected on unit for pulse output setting mode.

Set current ratio (for the rated current) for alarm using <ITEM/△><SHIFT/▽>.



(1.0 to 100.0)

<SET>

Stand-by alarm setting mode 1 *It is only when 'AL-S' is selected on unit for pulse output setting mode.

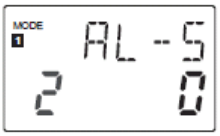
Set a ratio (for the rated current) of current used for threshold value to judge stand-by power using <ITEM/△><SHIFT/▽>.

(1.0 to <u>100.0</u>)

↓ **<SET>**

Stand-by alarm setting mode 2 *It is only when 'AL-S' is selected on unit for pulse output setting mode.

Set a time used for threshold value to judge stand-by power using <ITEM/△><SHIFT/▽>.



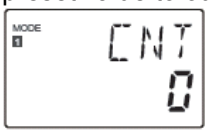
(<u>0</u> to 9999 min.)
'0': Alarm is always output at the time when judging the stand-by power.
'1 to 9999': Alarm is output at the time when passing the setting time with the stand-by power.

The alarm can be reset by pressing <SET> **with the instantaneous electric power display**.
After reset the alarm, start to monitor the stand-by power again.

↓ **<SET>**

Preset value setting mode *It is only when 'Cnt' is selected on unit for pulse output setting mode.

Set preset value to output using <ITEM/△><SHIFT/▽>.



(<u>0</u> to 999999)

↓ **<SET>**

Demand alarm setting mode 1

Set target value for alarm using <ITEM/△><SHIFT/▽>.

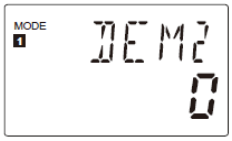
(<u>0.00</u> to 9999.99)

*In case of that 'DEM1' is set to 0.00kW, it doesn't output alarm and it doesn't indicate.

↓ **<SET>**

Demand alarm setting mode 2

Set the hysteresis to use for decide alarm off timing using <ITEM//△><SHIFT/▽>.



(<u>0</u> to 100)

↓ **<SET>**

Demand alarm setting mode 2

Set time to start demand monitor using <ITEM/△><SHIFT/▽>.

(1 to 30 <u>initial:10</u>)

↓ **<SET>**

Electricity charge setting mode

Set the rate per 1kWh using <ITEM/△><SHIFT/▽>.

(0.00 to 99.99 Initial: 10.00)

↓ **<SET>**

Conversion factor setting mode

Set the conversion factor per 1kWh using <ITEM/△><SHIFT/▽>.

(0.000 to 9.999 Initial: 0.410)

↓ **<SET>**

Monitor

4.2.2 MODE2 (Mode for setting of each parameter for pulse measurement)

Max. counting speed setting mode Hz

Mode defines max. counting speed.

・Select from 2000Hz(2kHz)/30Hz

Pre-scale setting mode PSCL

Mode defines pre-scale value used for changing count value.

・It can be set the range of 0.001 to 100.000. (Initial 1.000)

・The position of decimal point set with this mode is applied to count value and preset value.

ex) When 0.01 (Last 2-digit) is set, the decimal point of count value and preset value has 2 digit under decimal point.

Power input type setting mode PWER

Mode defines the input type to use for demand function.

・Select from CT / PM.

'CT': Use current measurement via CT for demand function.

'PM': Use pulse input for demand function.

*In case of that 'PM' is set, pulse count function is not available.

Pulse type setting mode P.SEL

*Only when 'PM' is selected on Power input type setting mode.

Mode defines pulse type.

・Select from kWh / PULSE

'kWh': Set the electric power per one pulse directly.

'PULSE': Use pulse constant value of pulse output device to use.

Pulse rate setting mode PM.kW

Mode defines pulse rate of electric power per 1 pulse.

・It can be set the range of 0.001 to 100.000kWh/pulse. (Initial 1.000)

Pulse constant value setting mode PM.PL

Mode defines a pulse constant value input by an outer pulse detector.
Check and select the pulse constant value of using pulse detector.

・Select from 50000 (pulse/kWh)/ 2000(pulse/kWh)

Clock correction setting mode CLK.A

Mode defines that it corrects clock using a frequency of measured voltage or not.

・Select from AUTO / MANUAL / OFF.

'AUTO': It corrects the clock automatically by judging the reference frequency in case of that the frequency of measured voltage is 50Hz or 60Hz.

'MANUAL': In case of that the reference frequency is not 50Hz or 60Hz, set a reference frequency to use for clock correction.

'OFF': It doesn't correct the clock.

Reference frequency setting mode FREQ

*Only when 'MANUAL' is selected on Clock correction setting mode.

Mode defines reference frequency to use for clock correction function.

・It can be set the range of 47.5 to 63.0 (Hz). (Initial 50.0)

ex.) Use this when the frequency of measured voltage is not 50Hz or 60Hz such as a private electric generator.

Mode2 Setting flow chart

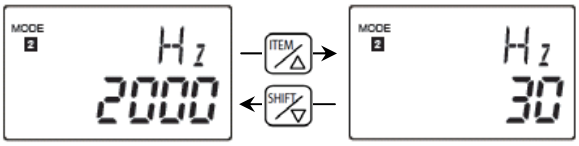
Monitor

↓ **<MODE> (MODE 2 Lighting)**

↓ **<SET>**

Max. counting speed setting mode

Press <ITEM/△><SHIFT/▽> to change 2000(2kHz) ⇔ 30（30Hz）.



2000(2kHz) 30(30Hz)

↓ **<SET>**

Pre-scale setting mode

Set pre-scale value using <ITEM/△><SHIFT/▽>.

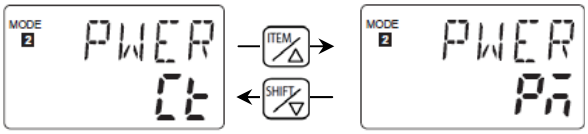
(0.001 to 100.000, initial 1.000)

*The decimal point set with this mode is applied to count value and preset value.

↓ **<SET>**

Power input type setting mode

Press <ITEM/△><SHIFT/▽> to change CT ⇔ PM.

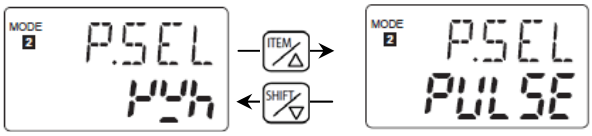


CT (CT input) PM (Pulse input)

↓ **<SET>**

Pulse type setting mode *It is only when 'PM' is selected on power input type setting mode.

Press <ITEM/△><SHIFT/▽> to change kWh ⇔ PULSE.



kWh PULSE

↓ **<SET>**

Pulse rate setting mode *It is only when 'kWh' is selected on pulse type setting mode.

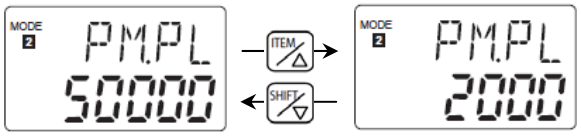
Set the rate per 1pulse using <ITEM/△><SHIFT/▽>.

(0.001 to 100.000 Initial: 1.000)

↓ **<SET>**

Pulse constant value setting mode *It is only when 'PULSE' is selected on pulse type setting mode.

Press <ITEM/△><SHIFT/▽> to change 50000 ⇔ 2000.



50000 2000

↓ **<SET>**

Clock correction setting mode

Press <ITEM/△><SHIFT/▽> to change AUTO ⇔ MANUAL ⇔ OFF.

AUTO MANUAL OFF

↓ **<SET>**

Reference frequency setting mode *It is only when 'MANUAL' is selected on clock correction setting mode.

Set the reference frequency using <ITEM/△><SHIFT/▽>.

(47.5 to 63.0 Initial: 50.0)

↓ **<SET>**

Monitor

4.2.3 MODE3 (Mode for setting of each parameter for serial communication)

Protocol setting mode PROT

Mode defines communication protocol of main unit via serial communication (RS485).

・Select from MEWTOCOL / MODBUS(RTU).

Station number setting mode NO

Mode defines an individual station no. for each unit when two or more units communicate via serial communication (RS485).

・It can be set the range of 1 to 99.

Transmission speed (Baud rate) setting mode SPD

Mode defines serial communication (RS485) transmission speed. Define the transmission speed according to the master's (PLC etc.).

・Select from 19200/ 38400 / 2400 / 4800 / 9600 [bps].

Transmission format setting mode FMT

Mode defines serial communication (RS485) transmission format (Data length, Parity). Define the transmission format according to the master's (PLC etc).

・Select from 8bit-o/7bit-n/7bit-E/7bit-o/8bit-n/8bit-E.

'n (none)' means parity is not available.

'E (Even)' means parity is even number.

'o (odd)' means parity is odd number.

*With MODBUS(RTU) protocol, it works only with 8bit.

Response time setting mode RESP

Mode defines serial communication (RS485) response time of main unit.

When command is received, it sends response after setting response time passes.

・It can be set the range of 1 to 99 ms.

Mode3 Setting flow chart

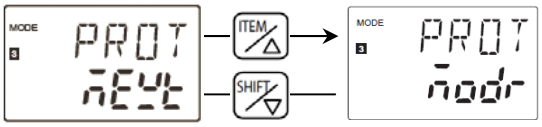
Monitor

↓ **<MODE> (MODE 3 Lighting)**

↓ **<SET>**

Protocol setting mode

Press <ITEM/△><SHIFT/▽> to change MEWTOCOL ⇔ MODBUS(RTU).



↓ **<SET>**

Station number setting mode

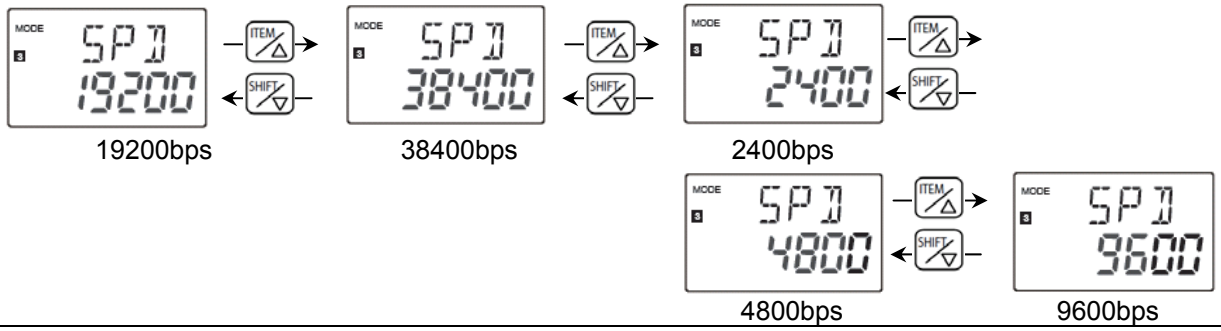
Set the station number using <ITEM/△><SHIFT/▽>.

(1 to 99)

↓ **<SET>**

Transmission speed setting mode

Press <ITEM/△><SHIFT/▽> to change 19200 ⇔ 38400 ⇔ 2400 ⇔ 4800 ⇔ 9600.

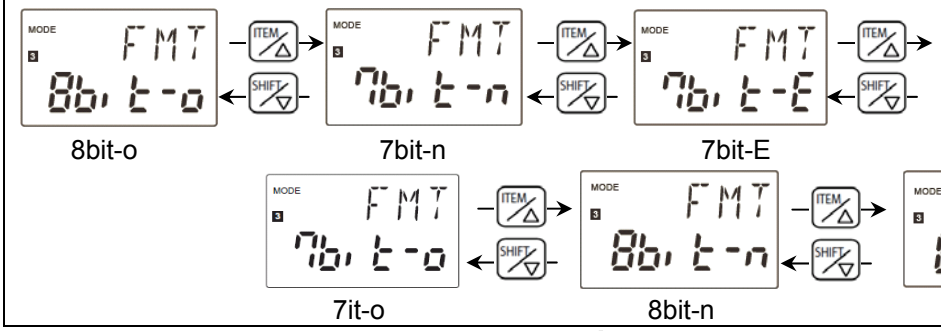


19200bps 38400bps 2400bps 4800bps 9600bps

↓ **<SET>**

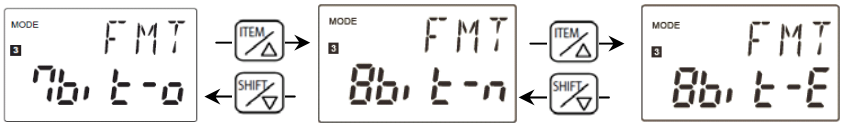
Transmission format setting mode

Press <ITEM/△><SHIFT/▽> to change 8bit-o ⇔ 7bit-n ⇔ 7bit-E ⇔ 7it-o ⇔ 8bit-n ⇔ 8bit-E.



n: not available
E: even number
o: odd number

8bit-o 7bit-n 7bit-E



7it-o 8bit-n 8bit-E

↓ **<SET>**

Response time setting mode

Set the response time using <ITEM/△><SHIFT/▽>.

(1 to 99ms)

↓ **<SET>**

Monitor

4.2.4 MODE4 (Mode for setting of each parameter for optional function)

Auto-off setting mode OFF

Display LCD turns off automatically when there is no key operation for a long time.

・Off time can be set the range of 0 to 99min.
'0' should be set if you want to turn always light on.
'1~99' should be set if you want to turn light off at setting time.
・After turns off the LCD, any key operation makes it turns on.
・After turns off the LCD, only power indicator turns on.

Version check mode VER

Mode to check version of the software.

It displays version of the software.

Saved file type selection mode FILE

Mode defines file types to write to SD memory card.

・Select ON and press <SET> for each type 1, 2 and 3, it writes to SD memory card.
・Select OFF and press <SET> for each type 1, 2, and 3, it doesn't write to SD memory card.
Type1: Instantaneous value file
Type2: Difference value file
Type3: Instantaneous value in detail file

*Refer to Chapter 5.4 for the detail contents of each file.
*Log cycle is fixed to 1-hour for type 1 and type 2.

Log cycle setting mode LOG

*Only when 'ON' is selected for T3 (type3) on saved file type setting mode.

Mode defines save cycle for type 3 file.

・Select from 1 / 5 / 10 / 15 / 30 / 60 (min).
It saves measured data with selected cycle.

Calendar timer setting mode CAL

Mode defines the year, month, day and time.

・Set year -> month -> date -> hour-> minute ->second.
・You can set the range of 2000 Jan. 1st 00:00:00 to 2099 Dec. 31st 23:59:59.

*Do not set the false date, or it might occur a malfunction.
Initialize memory of the main unit by 'initialize memory of main unit' (MODE4) after this setting. When it is not initialized, it may not display log data correctly.

Initialize memory of main unit S.FMT

Use to initialize memory of main unit and delete the saved logging data (measured data).

Use when you want to delete the logging data such as changing a measured load and so on.
・Select OFF and press <SET>, it doesn't initialize.
・Select ON and press <SET>, it initialize memory of main unit. Any key doesn't work during initializing.
*Initialize memory of main unit at the below timing, if it is not initialized, it may not display log data correctly.
when start using the unit, when it continues power off or no battery.
when change the power input type setting, when change the calendar timer setting
*It doesn't reset the displayed integrated value.

MODE4 Setting flow chart

Monitor

↓ **<MODE> (MODE 4 Lighting)**

↓ **<SET>**

Auto-off setting mode

Set auto-off time by minute using <ITEM/△><SHIFT/▽>.

(0 to 99)

'0' should be set to turn always light on.
'1~99' should be set to turn light off at setting time (minute).
While light off, press any key to light on.

↓ **<SET>**

Version check mode

It displays the version of software.

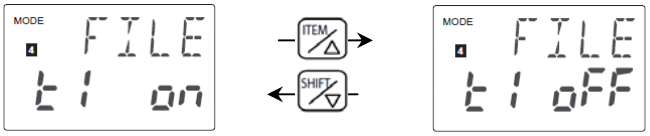
↓ **<SET>**

Saved file type selection mode

Press <ITEM/△><SHIFT/▽> to change ON/OFF.
Initial: ON
In order to write to SD memory card with the displayed file type, set to 'ON'.
There are 3 types and you can select ON or OFF for each type.

T1 (type1): Instantaneous value file

ON: Write data of the latest 1 month.
OFF: Not write



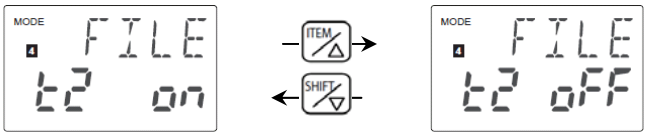
ON OFF

*Cycle is fixed to 1-hour.

↓ **<SET>**

T2 (type2): Difference value file

ON: Write data of the latest 1 month.
OFF: Not write



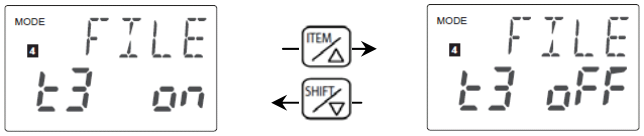
ON OFF

*Cycle is fixed to 1-hour.

↓ **<SET>**

T3 (type3): Instantaneous detailed value file

ON: Write the latest 5760 records (max.).
OFF: Not write



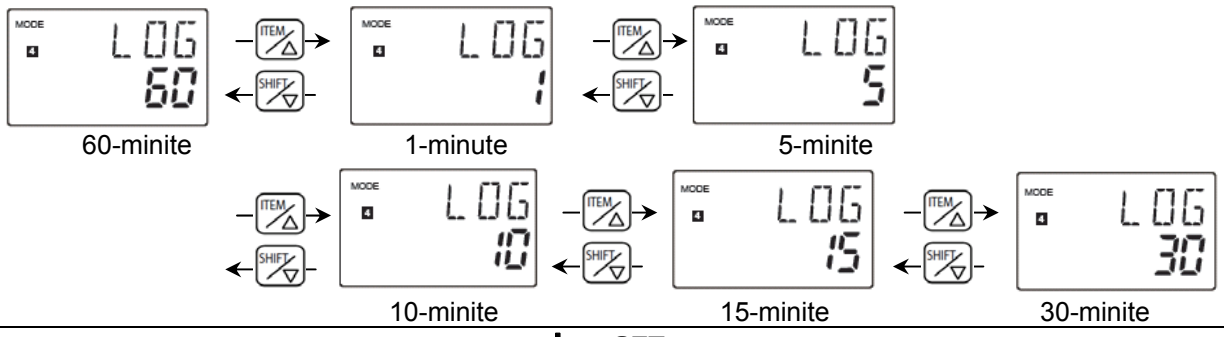
ON OFF

↓ **<SET>**

Log cycle setting mode

Press <ITEM/△><SHIFT/▽> to change 60 ⇔ 1 ⇔ 5 ⇔ 10 ⇔ 15 ⇔ 30.

*It is not shown when 'OFF' is selected for T3 (type3) on saved file type setting mode.



60-minite 1-minute 5-minite

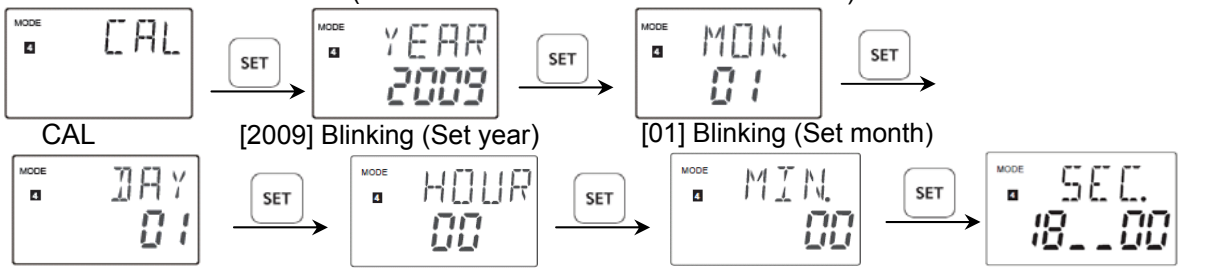
10-minite 15-minite 30-minite

↓ **<SET>**

Calendar timer setting mode

Set the present time using <ITEM/△><SHIFT/▽>, and <SET>.

(2000/1/1 00:00:00～2099/12/31 23:59:59)



CAL [2009] Blinking (Set year) [01] Blinking (Set month)

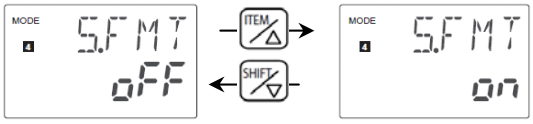
[01] Blinking (Set day) [00] Blinking (Set hour) [00] Blinking (Set minute) (left: present right: set) [00] Blinking (Set second)

↓ **<SET>**

Initialize memory of main unit

Press <ITEM/△><SHIFT/▽> to change OFF/ON.

Initial: OFF Select 'ON' and press <SET> and memory is initialized.



OFF ON

***Initialize memory of main unit at the below timing, if it is not initialized, it may not display log data correctly.**

when start using the unit, when it continues power off or no battery.

when change the power input type setting, when change the calendar timer setting

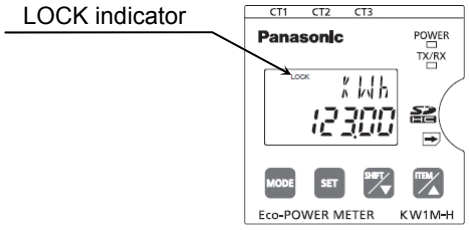
↓ **<SET>**

Monitor

Chapter 5 Various Functions

5.1 LOCK mode

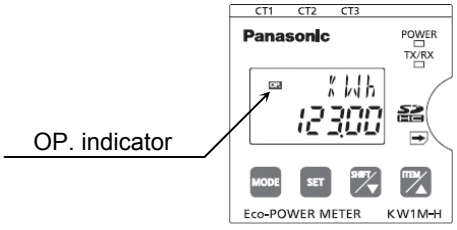
It is the mode makes all keys unable. Use when you want to fix one of the measurement displays (For all displays). In this mode, you can not input by any keys.
When you press <SET> continuously for about 3sec., the 'LOCK' indicator lights and all keys become locked (pressing them will have no effect).
Press <SET> continuously for about 3sec. again to release Lock mode. The 'LOCK' indicator goes off and the lock mode is released (unlocked).



5.2 Pulse output function

Refer to the mode 1 setting for the way to set.

'OP.' indicator is lighting when pulse output.

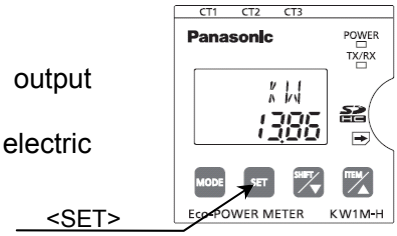


5.2.1 Output depends on integrated electric power
Set the unit for pulse output (0.001/0.01/0.1/1/10/100kWh) and pulse output (transistor output) turns on every time when integrated electric power reaches the unit. (Pulse width: about 100ms)

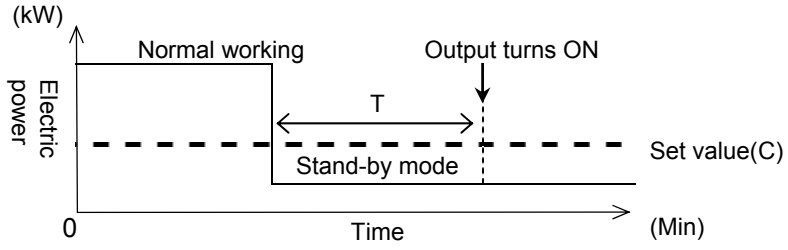
5.2.2 Instantaneous electric power alarm
When it exceeds the setting instantaneous electric power, pulse output (transistor output) turns on in order to notice. When it falls below, the output turns off.

5.2.3 Current alarm
When it exceeds the setting current ratio, pulse output (transistor output) turns on in order to notice. When it falls below, the output turns off.

5.2.4 Stand-by power alarm
When it detects stand-by power (current) of the measured load, pulse output (transistor output) turns on in order to notice.
Set current (C) and stand-by time (T) to judge stand-by power.
When the measured load is satisfied the setting conditions, pulse output (transistor output) turns on in order to notice.
You can reset the alarm by pressing <SET> with the instantaneous electric power display.



(Working flow chart)



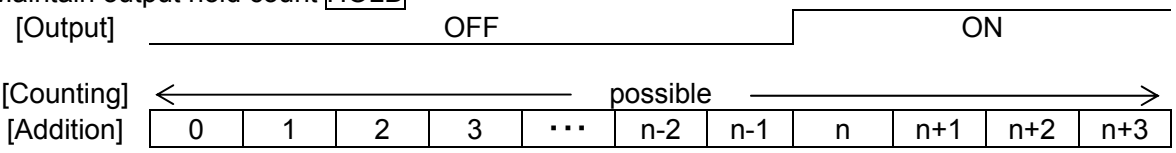
5.2.5 Output depends on count value
Set the preset value and pulse output (transistor output) turns on the time when count value reaches the preset value.

5.2.6 Demand alarm
Refer to the next in detail.

5.3 Counter function

5.3.1 Operation mode

Maintain output hold count HOLD



(1) Output control is maintained after count-up completion and until reset. However counting is possible despite of count-up completion.

(2) It reverts'0' after counting up full scale, but output control is maintained. However output is OFF if count value or preset value is changed.

5.3.2 Change the Preset Value

It is possible to change the preset value even during counting. However note the following points.

◇When the pre-scale value is '1.000'.（PSCL=1.000）

(1) If the preset value is changed to the value less than the count value, counting will continue until it reaches full scale, returns to '0' and then reaches the new preset value.

(2) If the preset value is changed to '0', it will not count up at start with '0'. It counts up when the counting value comes to '0' again (after reach to full scale). However output is OFF if count value or preset value is changed.

(3) When the count value is fixed, output is changed according to the changing of preset value as below.

①If the preset value is changed to the value less than the count value or same as count value, output is ON.

（Count value ≧ Preset value）

②If the preset value is changed to the value more than the count value, output is OFF.

（Count value ＜ Preset value）

◇When the pre-scale is not '1.000'.（PSCL≠1.000）

Even if the preset value is changed after counting to full scale, output is not changed.

5.4 Log data writing function

This is the function that it writes the measurement data to SD memory card.
There are 3 kinds of file to write.
File type 1: Instantaneous value (Saved cycle: fixed 1 hour)
File type 2: Difference value (Saved cycle: fixed 1 hour)
File type 3: Instantaneous detailed value (Saved cycle: select from 1/10/15/30/60 minutes)
Please refer to 5.4.4 about the details of writing data.

5.4.1 In case that you insert SD memory card

When measuring data are logged in the unit memory, the following data can be written.

File type 1, 2	One -month data of the latest 1.5 years (You can select when inserted.)
File type 3	Max. 5760 records (4 days data: Saved cycle 1min.) (Only the latest record)

<Guide for data capacity (Max. capacity for one-time writing)>

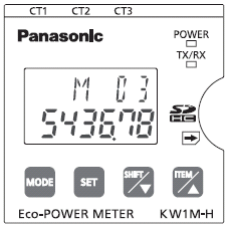
Max. data capacity for all file type	About 1MB (Writing time: about 3min.)
File type 1	About 150kB
File type 2	About 100kB
File type 3	About 700kB

◇How to write data of the latest one-month
(1) Set 'ON' for file type to save with saved file type selection mode (mode4).
(2) Shift to power monitoring mode display or calendar display.
(3) Insert SD memory card.
(4) It writes data according to the setting of saved file type selection mode.

File type 1, 2	Latest 1-month
File type 3	Latest 5760 records (max.) (4 days data: Saved cycle 1min.)

◇How to write data of the past month
(1) Set 'ON' for file type to save with saved file type selection mode (mode4).
(Available only type 1 and type2)
(2) Shift to display 'Monthly integrated electric power' in option mode.
(3) Select month to write.
(4) Insert SD memory card.
(5) It writes the measuring data of the displayed month with file type set to 'ON'.

<ex.> In case that you'd like to write data of March:
(1) Shift to the display on the right (upper: M03) by using <SET>,<SHIFT/▽>
and <ITEM/△>.
(2) Insert SD memory card.
(3) It writes the data from March 1st to 31st.



5.4.2 In case that SD memory card is always inserted to card slot

During inserting SD card to the card slot, it writes data at the time as below.
It writes the data every time to update.
<Note>
Set to 'ON' for the file type to write with 'Saved file type selection mode' (mode 4).

File type 1, 2	24:00 every day
File type 3	Same timing as log cycle

<Guide for data capacity (1-day: 24 hours)>

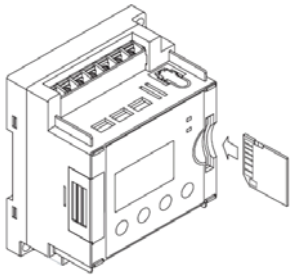
File type 1	About 4kB
File type 2	About 2kB
File type 3	About 210kB (Log cycle: 1 min)

*Recordable data capacity is depend on the SD memory card.
If there is no space to write, it will not write data after that and error is shown on the display.

<Notice>

Be sure to insert the direction of SD memory card correctly.
When it is inserted wrong direction, the unit or memory card may be damaged. Do not move the inserted memory card, or the unit or memory card may be damaged. Do not insert an unsupported memory card.

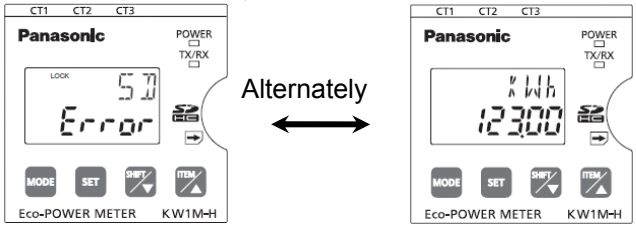
After writing data and removing SD memory card, insert a dummy card to protect in order to avoid dust or something else.



<Display during writing>
'SD ACCESS' is displayed during writing.
After completing the writing, shift to monitor display.
When there isn't enough capacity in SD memory card or SD memory card is unwritable, error display will appear alternately.

During writing

Display of writing error



<Notice>

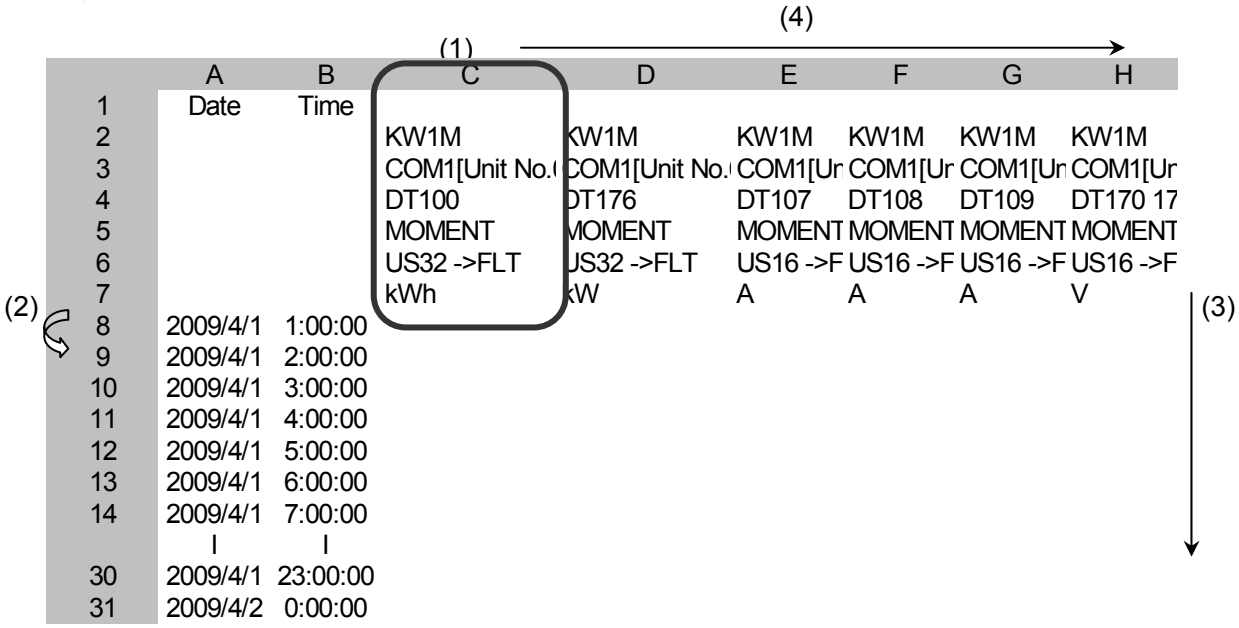
During 'SD ACCESS' is displayed, do not remove the memory card.
It may cause damage of data in memory card or damage of memory card or stop working.
In addition, during writing, it may not be able to measure nor communicate.

5.4.3 Unit memory

During measurement, measuring data is saved in the unit memory.
However, when it reaches the maximum capacity, the older data will be overwritten.
You can initialize the unit memory. (Refer to Mode 4.)

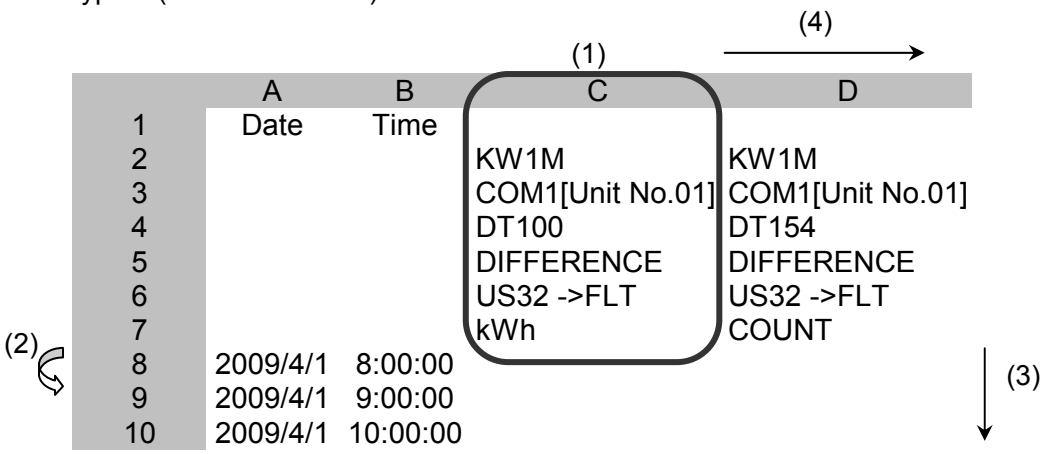
5.4.4 Format for written file

Data in SD memory card is saved with the below format as csv file.
The file format, which is saved by Eco-POWER METER, is fixed.
<File type 1 (Instantaneous value)>



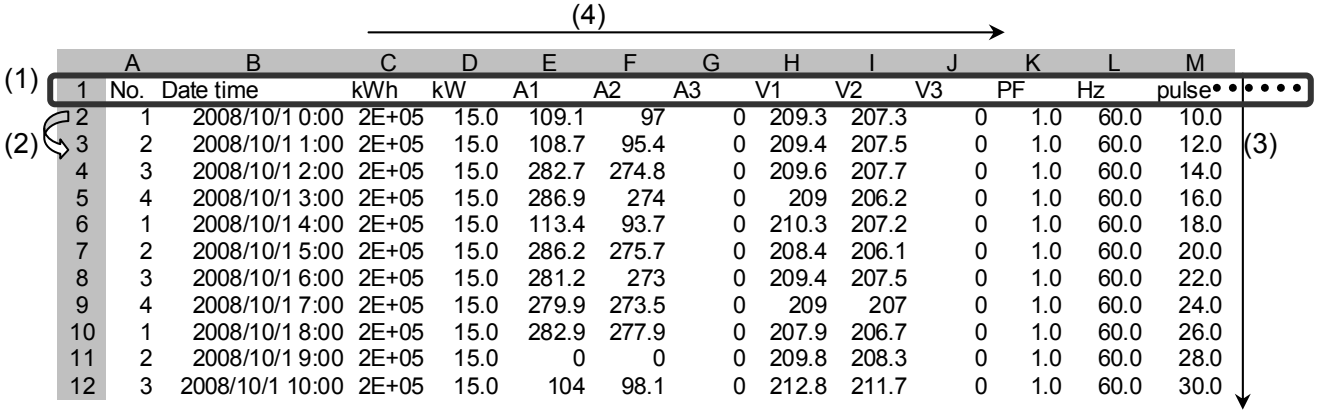
(1) Device information	(row 2)	KW1M	Model name
	(row 3)	COM1[Unit No.01]	Station number (based on the unit setting)
	(row 4)	DT100	Target address (only the beginning)
	(row 5)	MOMENT	Shows ‘instantaneous value’
	(row 6)	US32 -> FLT US16 -> FLT S16 -> FLT	Unsigned integer 32 bit Unsigned integer 16 bit Signed integer 16 bit
	(row 7)	kWh	Unit (based on the target address)
(2) Logging trigger	Timing to log data: 60 minutes fixed (at the end of each hour)		
(3) Record number	Record number for 1 file: 24 records fixed		
(4) Logging data	Logging data of the same timing: 11 data (fixed) From column C to M Integrated electric power, Instantaneous electric power, R-current, S-current, T-current, R(RS)-voltage, S(RT)-voltage, T(TS)-voltage, Power factor, Frequency, Count value		

<File type 2 (Difference value)>



(1) Device information	(Row 2)	KW1M	Model name
	(Row 3)	COM1[Unit No.01]	Station number (based on the unit setting)
	(Row 4)	DT100	Target address (only the beginning)
	(Row 5)	DIFFERENCE	Shows 'difference value'
	(Row 6)	US32 -> FLT	Unsigned integer 32 bit
	(Row 7)	kWh	Unit (based on the target address)
(2) Logging trigger	Timing to log data: 60 minutes fixed (at the end of each hour)		
(3) Record number	Record number for 1 file: 24 records fixed		
(4) Logging data	Logging data of the same timing: 2 data (fixed) From column C to D Integrated electric power, Count value		

<File type 3 (Instantaneous detailed value)>



	A	B	C	D	E	F	G	H	I	J	K	L	M
1	No.	Date time	kWh	kW	A1	A2	A3	V1	V2	V3	PF	Hz	pulse
2	1	2008/10/1 0:00	2E+05	15.0	109.1	97	0	209.3	207.3	0	1.0	60.0	10.0
3	2	2008/10/1 1:00	2E+05	15.0	108.7	95.4	0	209.4	207.5	0	1.0	60.0	12.0
4	3	2008/10/1 2:00	2E+05	15.0	282.7	274.8	0	209.6	207.7	0	1.0	60.0	14.0
5	4	2008/10/1 3:00	2E+05	15.0	286.9	274	0	209	206.2	0	1.0	60.0	16.0
6	1	2008/10/1 4:00	2E+05	15.0	113.4	93.7	0	210.3	207.2	0	1.0	60.0	18.0
7	2	2008/10/1 5:00	2E+05	15.0	286.2	275.7	0	208.4	206.1	0	1.0	60.0	20.0
8	3	2008/10/1 6:00	2E+05	15.0	281.2	273	0	209.4	207.5	0	1.0	60.0	22.0
9	4	2008/10/1 7:00	2E+05	15.0	279.9	273.5	0	209	207	0	1.0	60.0	24.0
10	1	2008/10/1 8:00	2E+05	15.0	282.9	277.9	0	207.9	206.7	0	1.0	60.0	26.0
11	2	2008/10/1 9:00	2E+05	15.0	0	0	0	209.8	208.3	0	1.0	60.0	28.0
12	3	2008/10/1 10:00	2E+05	15.0	104	98.1	0	212.8	211.7	0	1.0	60.0	30.0

(1) Item	(row 1) Measured data (Fixed)
(2) Logging trigger	Timing to log data: 1,10,15,30,60 min. (selectable with setting mode)
(3) Record number	Record number for 1 file: Max. 5760 records (It overwrites from older data.)
(4) Logging data	Logging data of the same timing: 15 data (fixed) From column C to Q Integrated electric power, Instantaneous electric power, R-current, S-current, T-current, R(RS)-voltage, S(RT)-voltage, T(TS)-voltage, Power factor, Frequency, Count value, Electrical power converted by pulse, Present demand, Load ON-time, Load OFF-time

*The numbers in column A are the internal number in unit memory, you can't change the numbers.

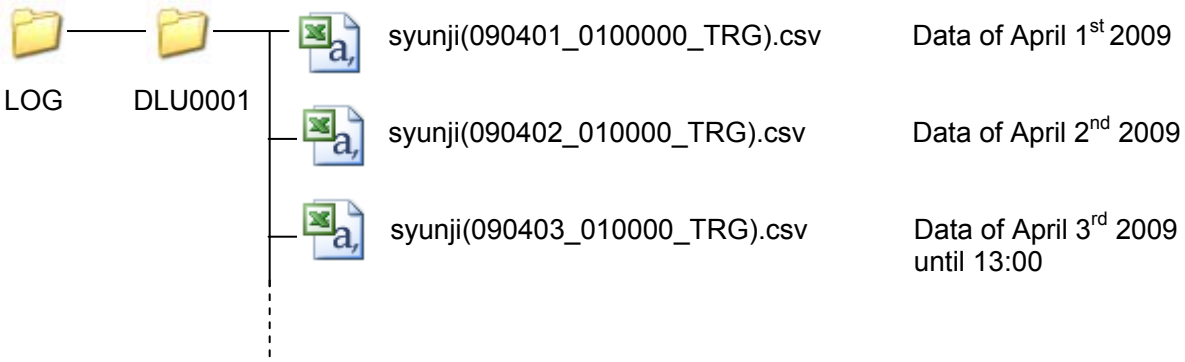
5.4.5 File name and Saved folder

Files are saved in SD memory card with the below constructions.

<File type 1 (Instantaneous value)>

When you insert SD memory card at 13:20, April 3rd 2009:

Folder



【Folder name】

LOG -> Fixed

DLU0001

Station number of Eco-POWER METER (Based on the unit setting)

【File name】

syunji(090401_010000_TRG).csv

Condition of saved file

hour/minute/second (01:00:00)

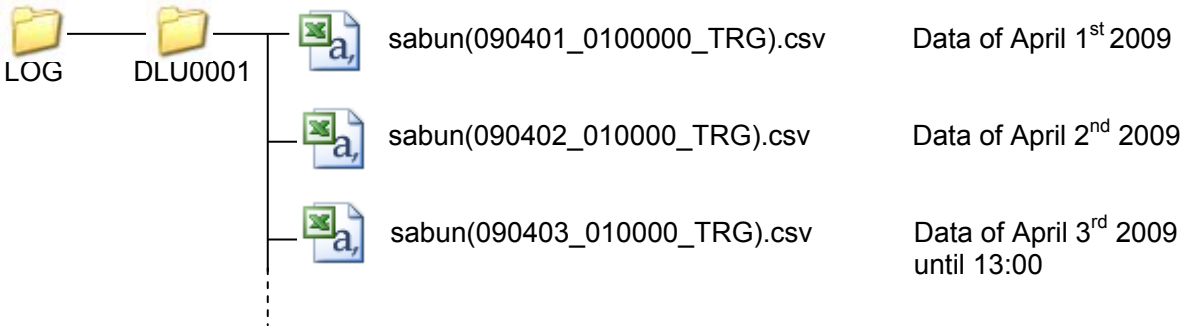
year/month/day (April 1st 2009)

year/month/day, hour/minute/second in file name is the data of the beginning record.

Condition of saved file	Recorded letter
'File write trigger' occurs.	TRG

<File type 2 (Difference value)>

When you insert SD memory card at 13:20, April 3rd 2009:



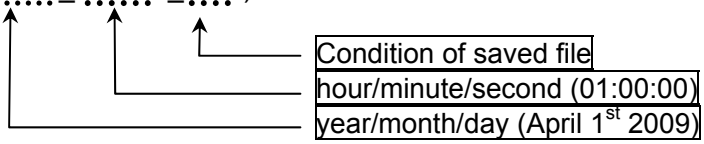
【Folder name】

LOG -> Fixed

DLU0001

Station number of Eco-POWER METER (Based on the unit setting)

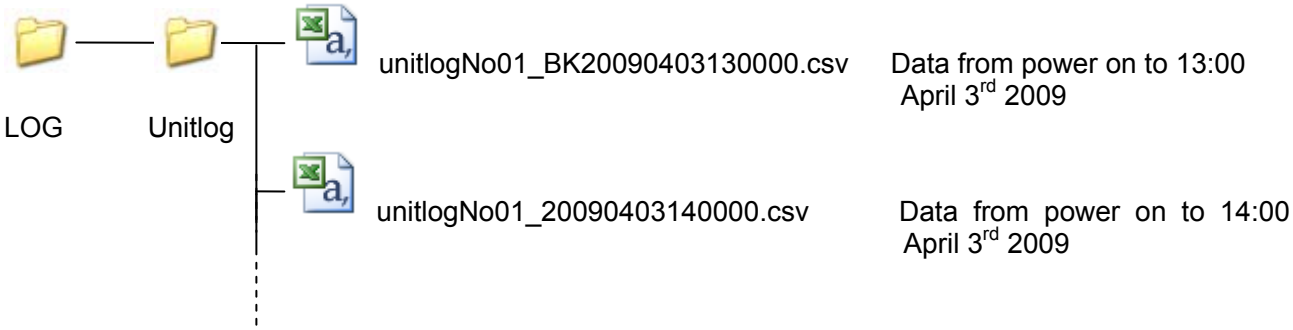
【File name】
sabun(090401_010000_TRG).csv



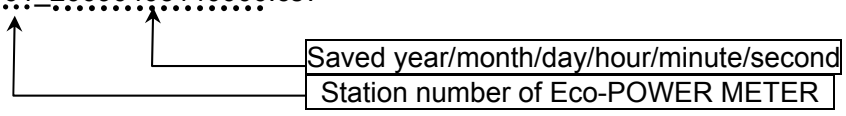
year/month/day, hour/minute/second in file name is the data of the beginning record.

Condition of saved file	Recorded letter
'File write trigger' occurs.	TRG

<File type 3 (Instantaneous detailed value)>
When you insert SD memory card at 13:00 and 14:00, April 3rd 2009:

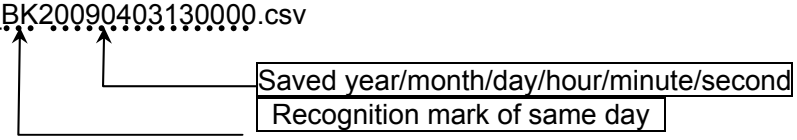


【Folder name】
LOG -> Fixed
Unitlog -> Fixed
【File name】
unitlogNo01_20090403140000.csv



14:00:00 April 3rd 2009

unitlogNo01_BK20090403130000.csv



13:00:00 April 3rd 2009

*Every time when you insert SD memory card, the new file is saved.
If you use SD memory card with csv file on the same day, 'BK' is added to the last file name.

5.4.6 Logging data
The decimal point is saved automatically when it saves with csv format.
The first record in file type 2 is the difference value from the value when start measurement.

5.5 Demand function

(Japanese demand)

A demand function is a function which presumes the average power for every 30 minutes time span, and it judges for every minute.

This works demand monitoring for electric power input by CT or pulse. In order to use demand monitoring by pulse input, input pulse that meet the specifications of 8.2.3.

It outputs demand alarm according to the setting conditions.

Please use this simple demand function as your standard. The value is not guaranteed.

Caution

(1)Definition of demand

It is demand measurement in order to use by yourself as your standard.

(2) The time used by this function is the time set up with Eco-POWER METER.
Therefore, it is different from the demand meter controlled by an electric power company.

◆Output demand alarm and Display demand alarm

When present demand or estimated demand exceeds the demand setting value, it output and it displays.

[Present demand or Estimated demand ≧ Demand setting value]

It keeps alarm output and alarm indication for 1 minute, after that,

[Present demand or Estimated demand ≧ Demand setting value] -> Keep alarm

[Present demand or Estimated demand ＜ Demand setting value] -> Clear alarm

When you set the hysterisis with demand alarm setting mode 2, the timing of clear alarm is as below.

Ex.) Demand setting value: 100kW　Hysterisis: 10%

When the present demand or the estimated demand exceeds 100kW, it output alarm and keep the alarm for 1 minute. After that if the current demnd or the estimated demand exceeds 90kW, it keep the alarm. If it is below 90kW, it clears alarm.

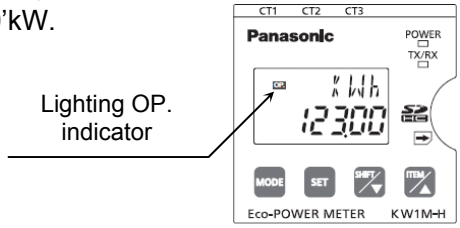
When you set the hysterisis, it can avoid frequent alarm output ON/OFF near a demand target value.

【Alarm output】

・It output with pulse output terminal.(open collector)

・It output only when ‘DEM’ is set with unit for pulse output setting mode.

・It doesn’t output alarm if demand setting value is set to ‘0.00’kW.

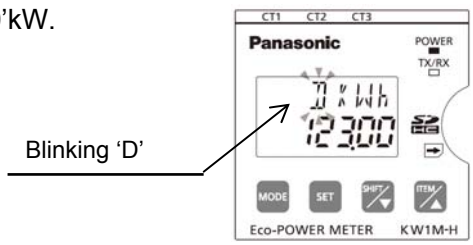


【Alarm indication】

・’d’ is blinking on the bottom line of the display.

・It indicates ‘d’ when the present demand or the estimated demand exceeds the setting value, regardless the setting of unit for pulse output setting mode.

・It doesn’t output alarm if demand setting value is set to ‘0.00’kW.



◆Working at power failure and at recovery

<At power failure>

・It stops the demand measurement.

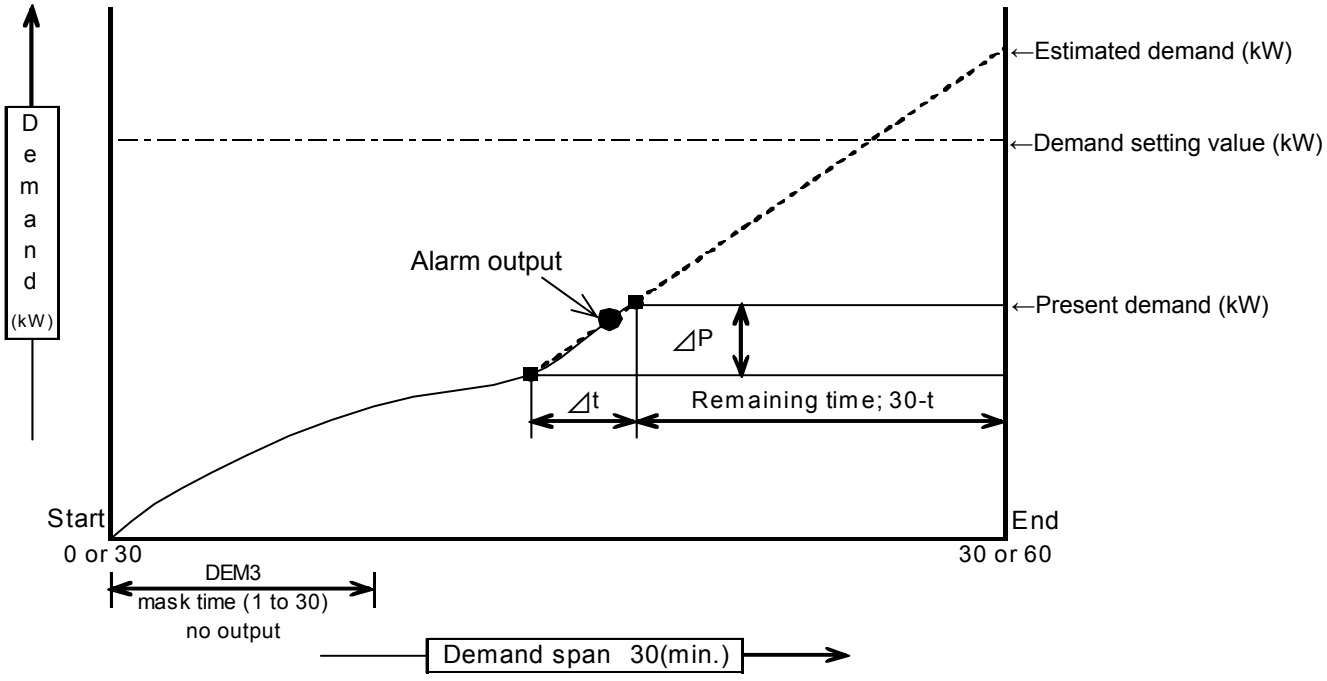
・The data of present demand, demand log, monthly max. log and max.demand will be saved by the build-in battery.

<At recovery>

・When it recovers within the demand span, it will start measurement of present demand again with the condition before power failure. The estimated demand and ratio of estimated demand are calculated again at recovery and displayed.

・When it recovers at the next demand span, it will stop the measurement until next demand span starts.

◆Working outline



<Present demand (PV)>

It shows demand value from the time when demand span starts to present time.

[Calculation]

CT input (calculated by Eco-POWER METER)

$$\text{Present demand (kW)} = \text{Integrated electric power until present from the start} \times \frac{60\ (\text{min.})}{30\ (\text{min.})\ \text{Demand span}}$$

$$= \text{Integrated electric power until present from the start} \times 2$$

Pulse input (integrated pulse input from a power meter)

$$\text{Present demand (kW)} = (\text{Integrated electric power until present from the start} \times \text{pulse rate}) \times \frac{60\ (\text{min.})}{30\ (\text{min.})\ \text{Demand span}}$$

$$= (\text{Integrated electric power until present from the start} \times \text{pulse rate}) \times 2$$

<Estimated demand (EV)>
It shows the estimated demand value at the end of demand span according to the using power from the time when demand span starts to present time.

[Calculation]

$$\text{Estimated demand(kW)} = \text{Present demand} + \frac{\text{Power change amount for } \Delta t \text{ minutes } (\Delta P)}{\text{Sampling cycle } \Delta t \text{ (minute)}} \times \text{Remaining time (minute)}$$

<Demand setting value (SV)> It shows the threshold for demand alarm output and indication.

<Remaining time (the bottom line)> Demand span (30) － (minus) Elapse time (t)

<Ratio of estimated demand (SET.R)> Ratio of estimated demand to demand setting value

<Alarm output / indication>
When present demand or estimated demand is satisfied the setting conditions, it output alarm and it indicates alarm.

5.6 Clock Correction function

This is the function that it corrects the clock of Eco-POWER METER by synchronizing with the frequency of measured voltage.
By counting the frequency of the measured voltage, it corrects the clock of Eco-POWER METER every 24-hour. It counts the frequency of the measured voltage connected to P1-P0 terminals as reference frequency. Therefore when P1-P0 terminals are not connected or it set OFF for clock correction function, it doesn't correct the clock.

Caution

In order to correct the clock, it is always monitoring if the reference frequency is stable or not.
If the frequency is not satisfied below conditions, it judges it is unstable and it doesn't correct the clock.
<conditions>
Variation for the reference frequency : ±0.5% during 10 seconds
Error between the internal clock and the clock by counting the reference frequency:
±24 seconds during 24-hour

◆Working at power failure and at recovery
<At power failure>
・It stops the clock correction function and changes to use the internal clock automatically.

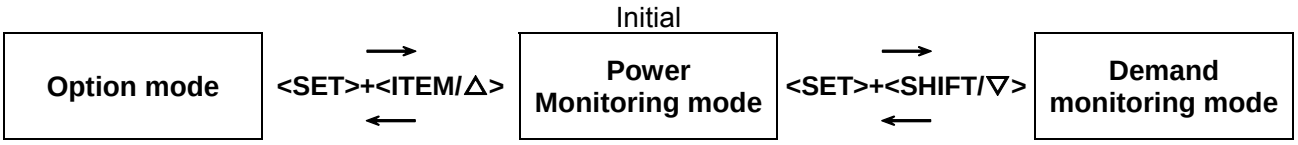
<At recovery>
・It will start the clock correction function from monitoring the reference frequency.

Chapter 6 Display of each Value

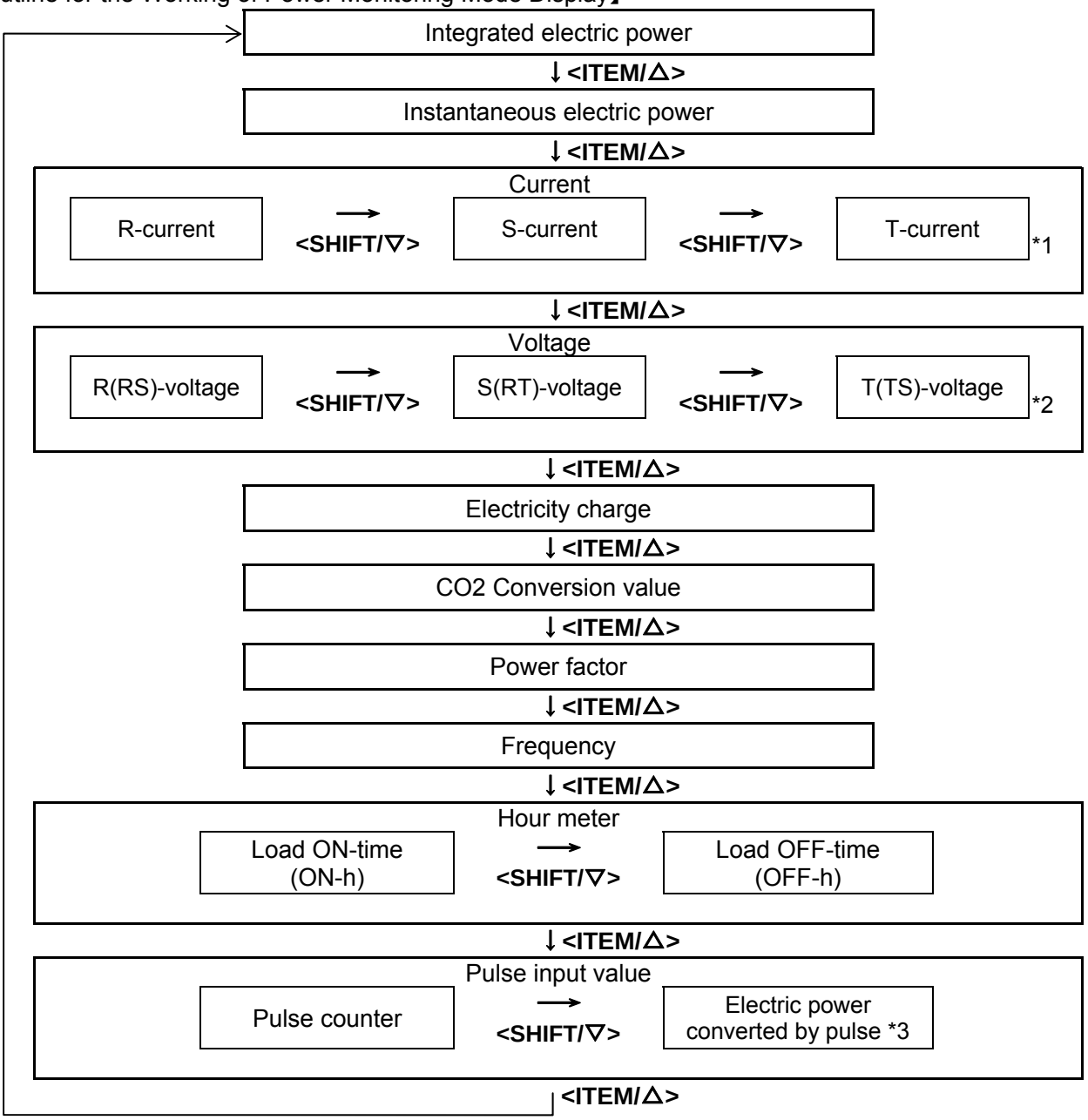
6.1 Working of Monitor Display

【Shift the display mode】

It shifts displays for power monitoring mode and it for option mode by pressing <ITEM/△> and <SET>.
It shifts displays for power monitoring mode and it for simple demand monitoring mode by pressing <SET> and <SHIFT/▽>.



【Outline for the Working of Power Monitoring Mode Display】

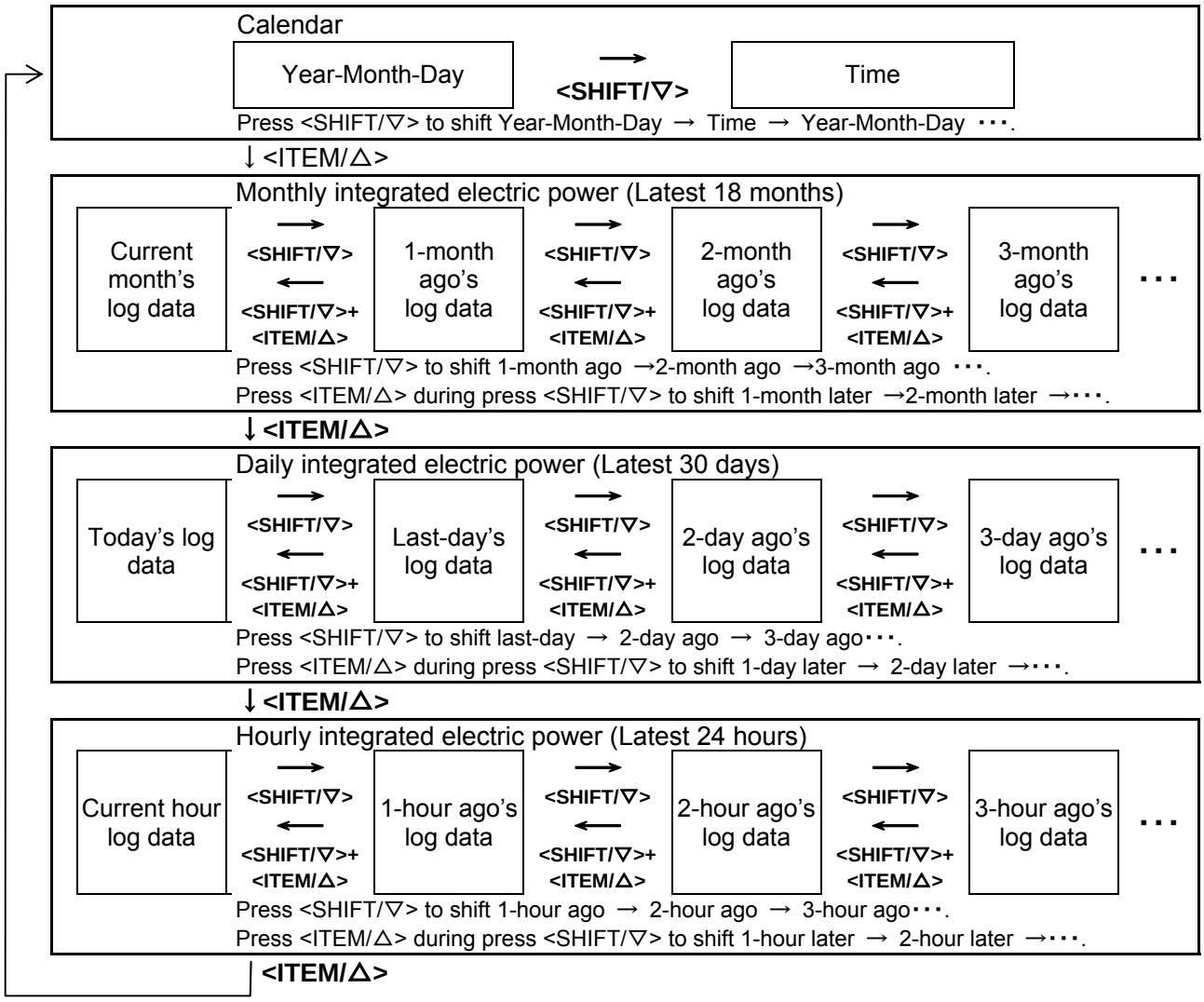


*1,2
The display is changed according to the phase and wire system.

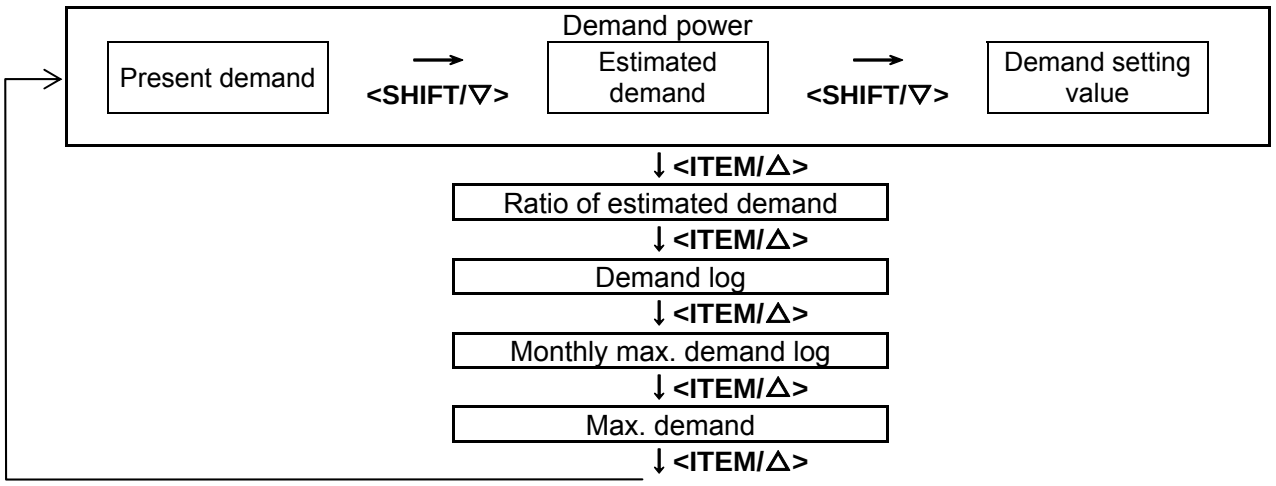
	Current	Voltage		
1P2W system	R-current	R-voltage		
1P3W system	R-current T-current	R-voltage, T-voltage (P1-P0) (P2-P0)		
3P3W system	R-current, S-current, T-current	RS-voltage, (P1-P0)	RT-voltage, (P1-P2)	TS-voltage (P2-P0)
3P4W system	R-current, S-current, T-current	R-voltage, (P1-P0)	S-voltage, (P2-P0)	T-voltage (P3-P0)

*3 It is displayed when ‘PM’ is selected with power input type setting mode.

【Outline for the Working of Option Mode Display】



【Outline for the Working of Demand monitoring mode display】



6.2 Power Monitoring mode

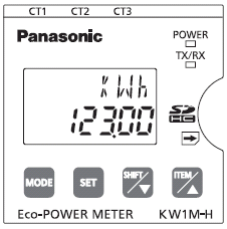
Power on the unit and it displays the monitor.

6.2.1 Integrated electric power

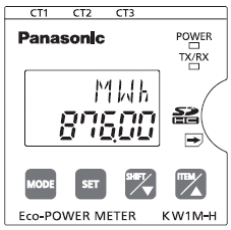
・It displays the integrated electric power.

Sample

kWh



MWh



・Integrated electric power is measured and displayed from 0.00kWh to 9999.99MWh.

・The decimal point is changed automatically.

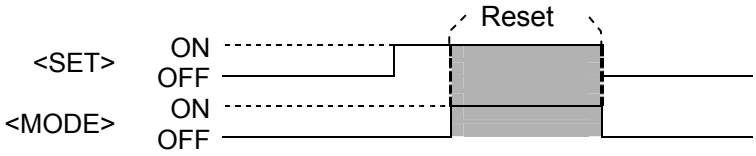
kWh → kWh → kWh → kWh → MWh → MWh

0.00 → 9999.99 → 10000.0 → 99999.9 → 100.00 → 9999.99 →

(After reaching the full scale (99999.9kWh), the value reverts to 0.00kWh but continues to measure.)

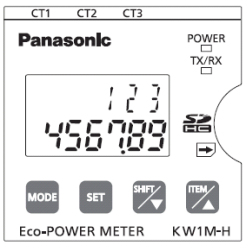
How to reset

・Hold down <SET> and press <MODE> makes integrated electric power clear.



How to display with 9-digit

Sample



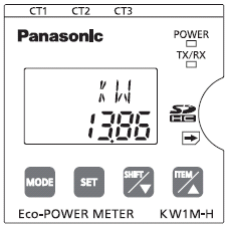
Integrated electric power can be displayed with 9-digit.

・Press <SHIFT/▽> and <ITEM/△> simultaneously at integrated electric power display (kWh/MWh) and integrated electric power with 9-digit is displayed.

6.2.2 Instantaneous electric power

・It displays the Instantaneous electric power.

Sample Instantaneous electric power (kW)



6.2.3 Current

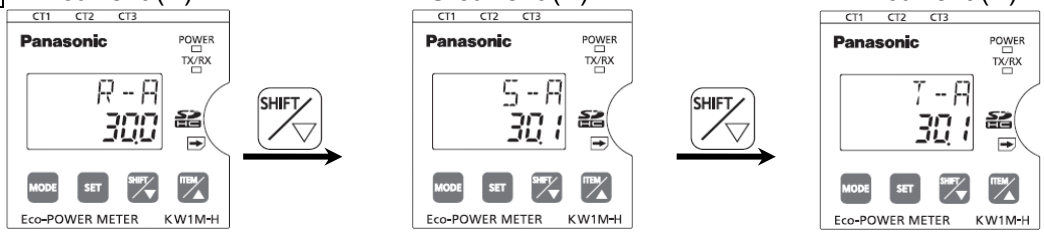
・It displays the current value of the load.

・Press <SHIFT/▽> to change R-current, S-current, T-current.

*Before start measuring, select phase and wire system according to the measured load.
When it sets wrong, it doesn't measure correctly. (Refer to the explanation of setting mode.)

Sample

R-current (A) S-current (A) T-current (A)



・When input current is under the setting cut-off current, it displays '0.0' and doesn't measure.

・When input current exceeds 150%F.S. at each range, [- - - - - -] will be displayed.

・Current measurement parts

Eco-POWER METER measures the current as below.

System \ Display	R-A	S-A	T-A
Single-phase two-wire	R-current	(Skip)	(Skip)
Single-phase three-wire	R-current	(Skip)	T-current
Three-phase three-wire	R-current	S-current	T-current
Three-phase four-wire	R-current	S-current	T-current

6.2.4 Voltage

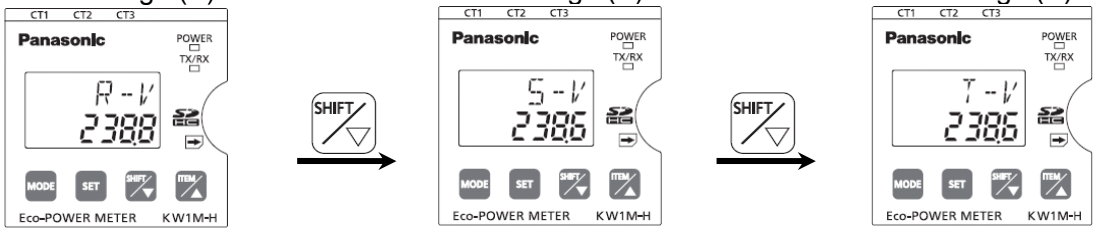
・It displays the voltage value of the load.

・Press <SHIFT/▽> to change voltage, R(RS)-voltage, S(RT)-voltage and T(TS)-voltage.

*Before start measuring, select phase and wire system according to the measured load.
When it sets wrong, it doesn't measure correctly. (Refer to the explanation of setting mode.)

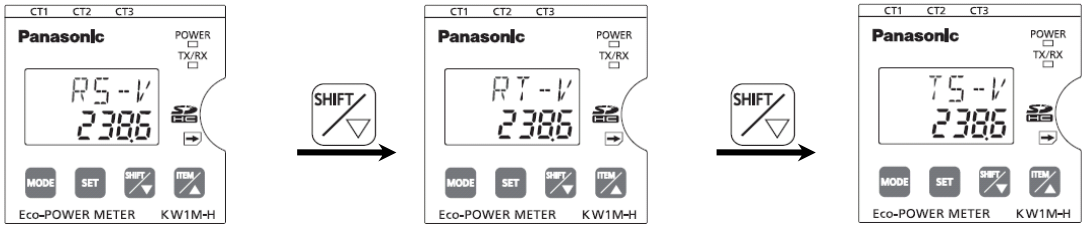
Sample for 1P2W / 1P3W / 3P4W

R-voltage (V) S-voltage (V) T-voltage (V)



Sample for 3P3W

RS-voltage (V) RT-voltage (V) TS-voltage (V)



・When input voltage is under 5% of rating, it displays '0.0' and doesn't measure.
('Under 5%' means the value getting from this calculation 'rated voltage 200(400) x 0.05 x VT ratio'.)

・When input voltage exceeds 150%F.S. at each range, [- - - - - -] will be displayed.

・Voltage measurement parts

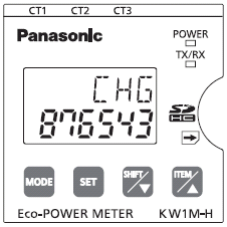
Eco-POWER METER measures the voltage as below.

Display / System	R-V / RS-V	S-V / RT-V	T-V / TS-V
Single-phase two-wire	R-voltage (P1-P0) (line voltage)	(Skip)	(Skip)
Single-phase three-wire	R-voltage (P1-P0) (phase voltage)	(Skip)	T-voltage (P2-P0) (phase voltage)
Three-phase three-wire	RS-voltage (P1-P0) (line voltage)	RT-voltage (P1-P2) (line voltage)	TS-voltage (P2-P0) (line voltage)
Three-phase four-wire	R-voltage (P1-P0) (phase voltage)	S-voltage (P2-P0) (phase voltage)	T-voltage(P3-P0) (phase voltage)

6.2.5 Electricity Charge

・It displays the standard electricity charge for the integrated electrical power.

Sample

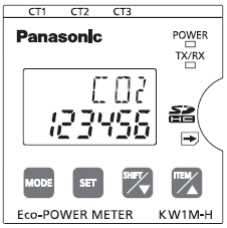


*When the value exceeds ‘999999’, [- - - - - -] will be displayed.

6.2.6 Carbon dioxide conversion value

・It displays the standard conversion value for the integrated electrical power.

Sample CO_2 conversion value (kg-CO_2)



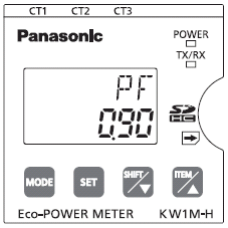
*When the value exceeds ‘999999’, [- - - - - -] will be displayed.

6.2.7 Power factor

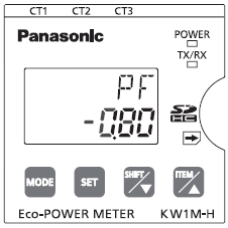
・It displays power factor of the load.

Sample

Lagging phase



Leading phase



・How to calculate power factor

Eco-POWER METER displays power factor by calculating as below.

Power factor operation is a method assuming balanced load. The error might be big when it measures unbalanced load.

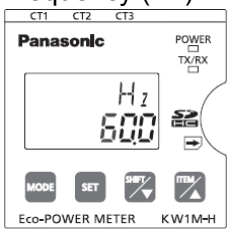
Single-phase two-wire	$PF = \frac{\text{Instantaneous electric power}}{\text{Voltage} \times \text{Current}}$	
Single-phase three-wire Three-phase four-wire	$PF = \frac{\text{Instantaneous electric power}}{a \times \left(\text{Average of each phase V}\right) \times \left(\text{Average of each phase A}\right)}$	1P3W: a=2 3P4W: a=3
Three-phase three-wire	$PF = \frac{\text{Instantaneous electric power}}{\sqrt{3} \times \left(\text{Average of each phase V}\right) \times \left(\text{Average of each phase A}\right)}$	

6.2.8 Frequency

・It displays the frequency.

Sample

Frequency (Hz)



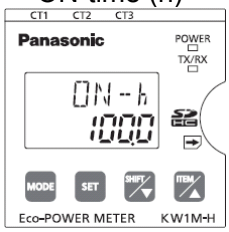
6.2.9 Hour meter

・It displays ON-time and OFF-time of the load measured by CT1.

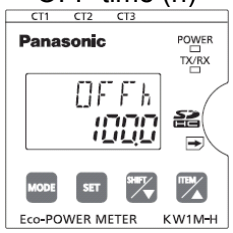
・Press <SHIFT/▽> to change the load ON-time to load OFF-time.

Sample

ON-time (h)



OFF-time (h)

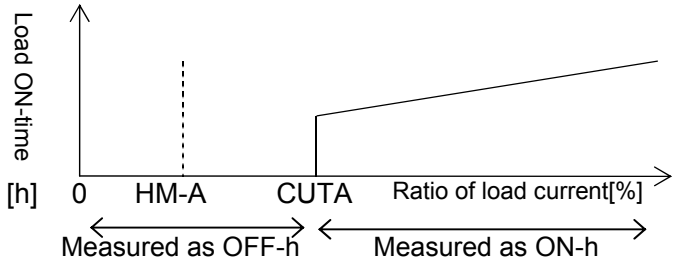


Blinking the decimal point during measurement of ON-time.

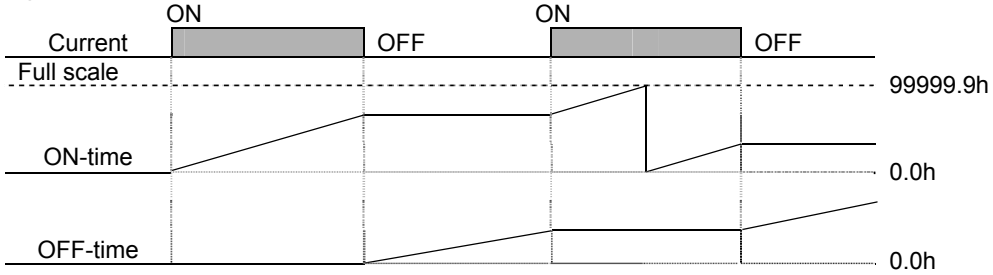
Blinking the decimal point during measurement of OFF-time.

*When load current is under the setting current for time measurement (HM-A), it measures as OFF-time. When load current is exceeded to the setting current for time measurement (HM-A), it measures as ON-time. Current for time measurement (HM-A) is set to under cutoff current (CUTA), all current is measured as OFF-time.

∗ Current flow of CT1

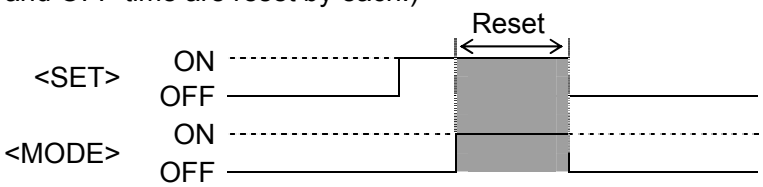


*After reaching the full scale (99999.9h), the value reverts to 0.0h but continues to measure.



How to Reset ON/OFF-time

・Hold down <SET>key and press <MODE>key makes ON-time or OFF-time clear. (ON-time and OFF-time are reset by each.)



6.2.10 Pulse input value

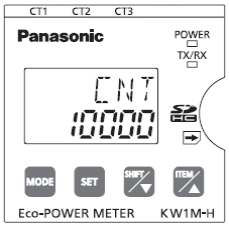
・It displays present pulse input value.

・Press <SHIFT/▽> to change pulse counter and electric power converted by pulse.

*Electric power converted by pulse is displayed when 'PM' is selected with power input type setting mode.

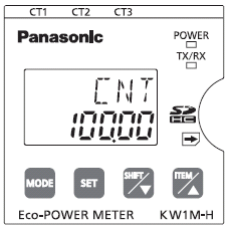
Sample

Pulse counter

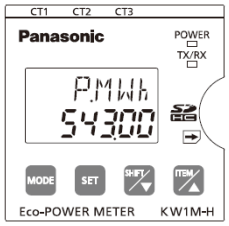


Electric power converted by pulse (kWh)

Prescale: 0.01



Electric power converted by pulse (MWh)

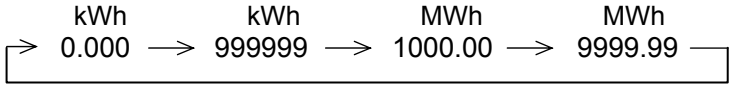


・Pulse counter is counted and displayed 0 to 999999 for pulse counter.

*After reaching the full scale (999999), the value reverts to 0 but continues to measure.

・Electric power converted by pulse is measured and displayed from 0.000kWh to 9999.99MWh.

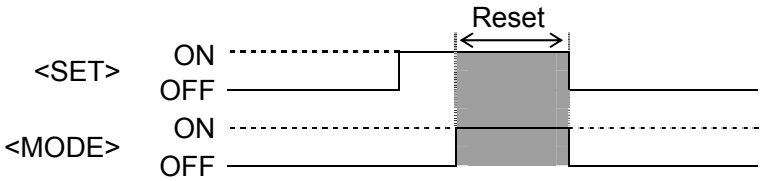
・The decimal point and unit are changed automatically.



(After reaching the full scale (9999.99MWh), the value reverts to 0.00kWh but continues to measure.)

How to Reset

・Hold down <SET> and press <MODE> makes pulse input value clear.



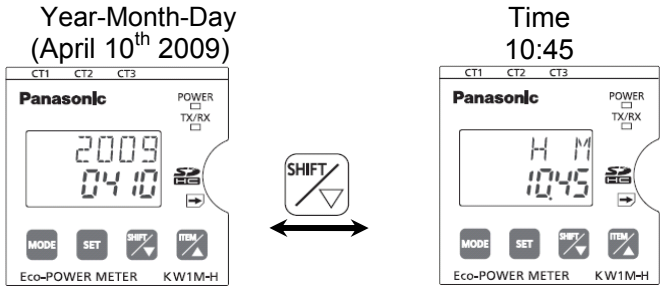
6.3 Option mode

During power monitoring mode, hold down <SET> and press <ITEM/△> to shift to option mode.

6.3.1 Calendar/Timer

・It displays the present time.
・Press <SHIFT/▽> to change Year-Month-Day to Time.

Sample

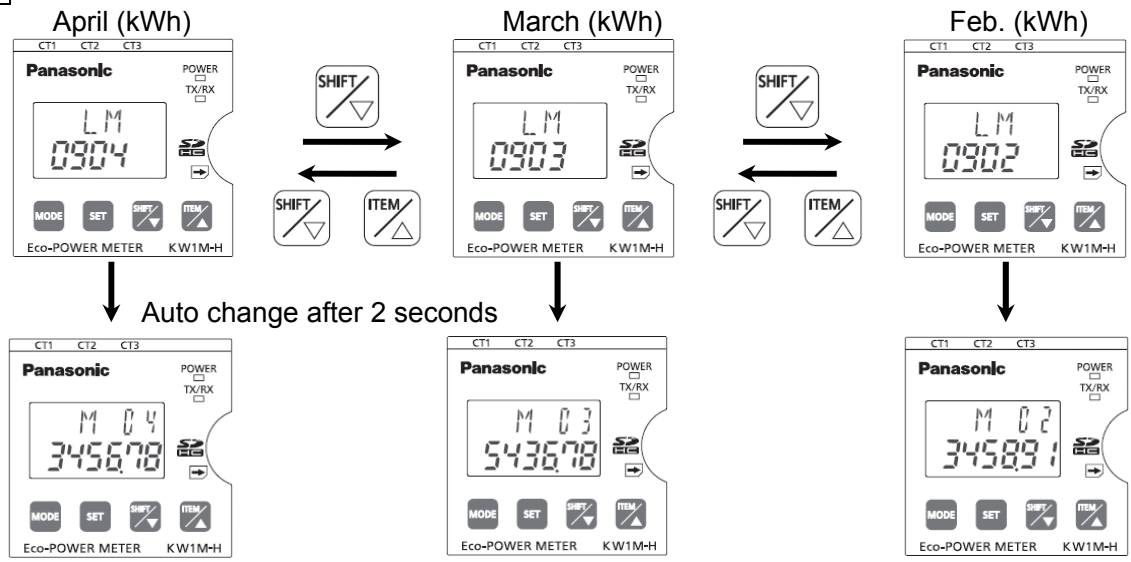


6.3.2 Monthly integrated electric power (kWh)

・It displays Monthly integrated electric power. It can display a log data for the latest 18 months.
・Press <SHIFT/▽> to shift 1-month ago, 2-month ago, 3-month ago ・・・.
Select month and it displays monthly integrated power after 2 seconds.
・Press <ITEM/△> with holding down <SHIFT/▽> to shift 1-month later, 2-month later, 3-month later ・・・.
・Period of month is designated as below table. The displayed unit is 'kWh'.

Display	LM 0904		LM 0903		LM 0902	
	From	to	From	to	From	to
Measuring period	2009 April 1st 00:00:00	April 30th 23:59:59	2009 March 1st 00:00:00	Mar. 31st 23:59:59	2009 Feb. 1st 00:00:00	Feb. 28th 23:59:59

Sample

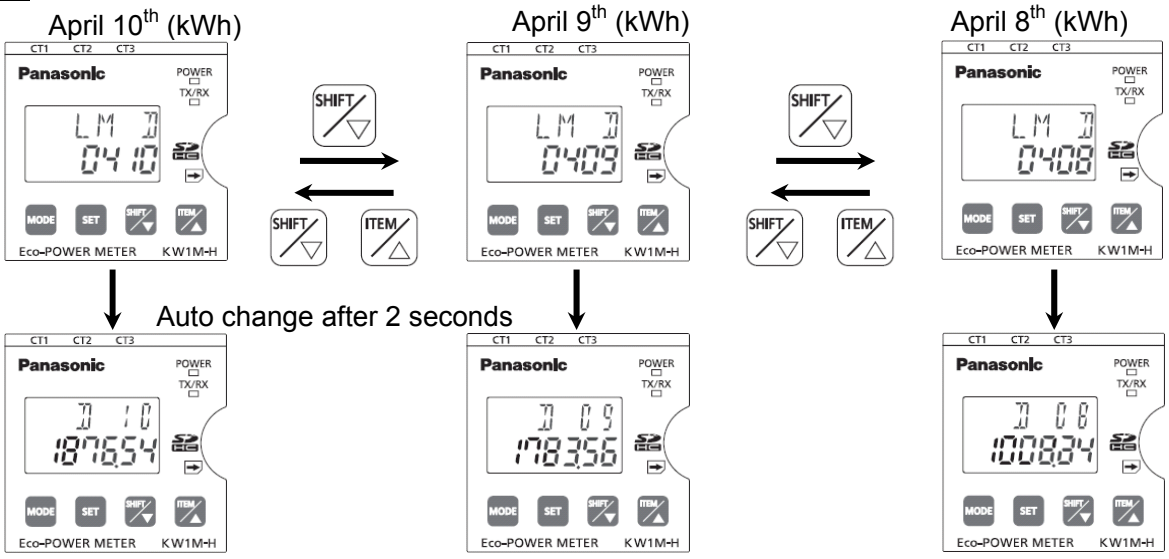


6.3.3 Daily integrated electric power (kWh)

・Press <ITEM/△> to display Daily integrated electric power.
It can display a log data for the latest 31 days.
・Press <SHIFT/▽> to shift 1-day ago, 2-day ago, 3-day ago ・・・. Select day and it displays daily integrated power after 2 seconds.
・Press <ITEM/△> with holding down <SHIFT/▽> to shift 1-day later, 2-day later, 3-day later ・・・.
・Period of day is designated as below table. The displayed unit is 'kWh'.

Display	LM D 0410		LM D 0409		LM D 0408	
Measuring period	From	To	From	To	From	To
	April 10th 00:00:00	April 10th 23:59:59	April 9th 00:00:00	April 9th 23:59:59	April 8th 00:00:00	April 8th 23:59:59

Sample

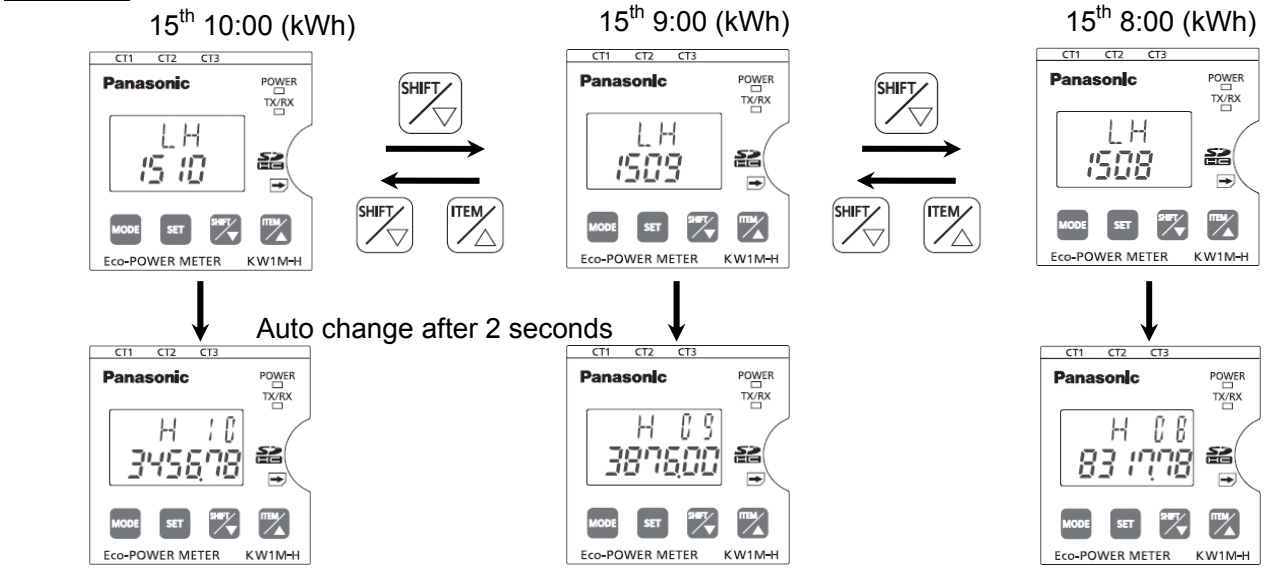


6.3.4 Hourly integrated electric power (kWh)

・It displays hourly integrated electric power. It can display a log data for the latest 24 hours.
・Press <SHIFT/▽> to shift 1-hour ago, 2-hour ago, 3-hour ago ・・・.
Select day and it displays hourly integrated power after 2 seconds.
・Press <ITEM/△> with holding down <SHIFT/▽> to shift 1-hour later, 2-hour later, 3-hour later ・・・.
・Period of hour is designated as below table. The displayed unit is 'kWh'.

Display	LH 1510		LH 1509		LH 1508	
Measuring period	From	To	From	To	From	To
	15th 10:00:00	15th 10:59:59	15th 09:00:00	15th 09:59:59	15th 08:00:00	15th 08:59:59

Sample



6.4 Demand monitoring mode

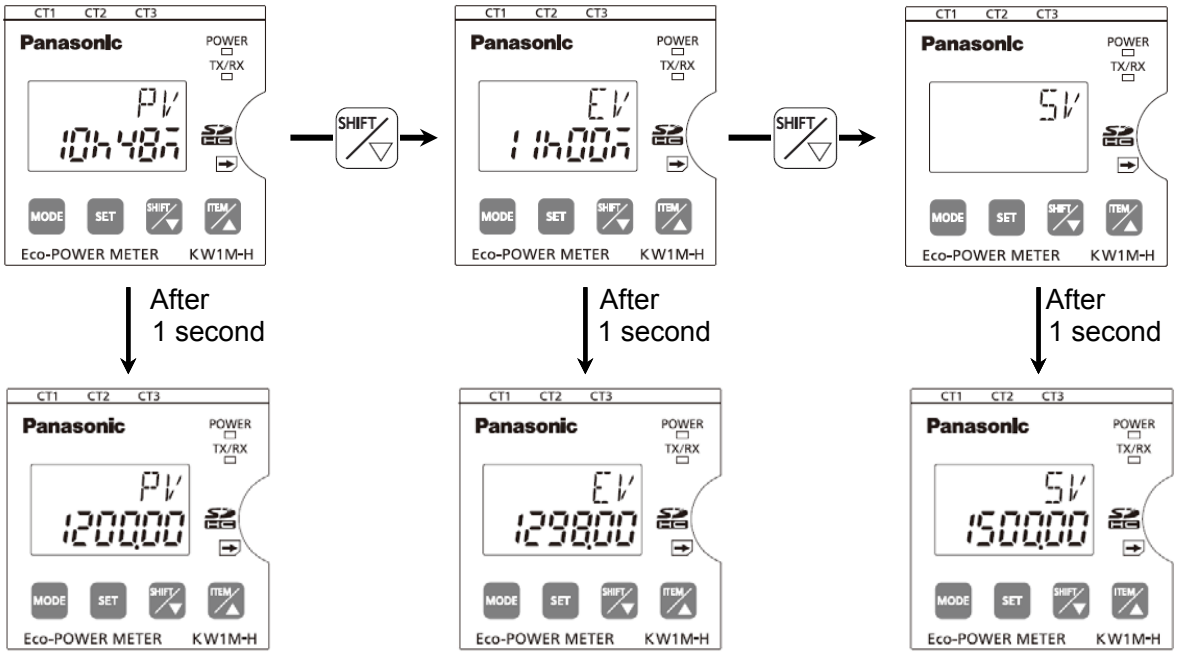
During power monitoring mode, hold down <SET> and press <SHIFT/▽> to shift to simple demand monitoring mode.

6.4.1 Demand power display

- It displays each demand value.
- Press <SHIFT/▽> to shift present demand, estimated demand, demand setting value.
- On the present demand display, it displays the present time first and displays the present demand after 1 second.
- On the estimated demand display, it displays the end time of the demand span first and displays the estimated demand.
- Demand setting value is set with DEM1 of mode 1.

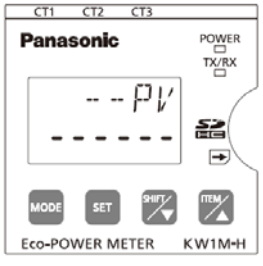
[Example]

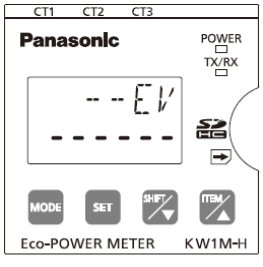
Present demand → Estimated demand → Demand setting value



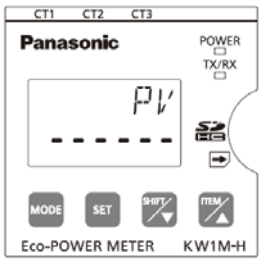
- The present demand is updated every 1 second, the estimated demand is updated every 1 minute.

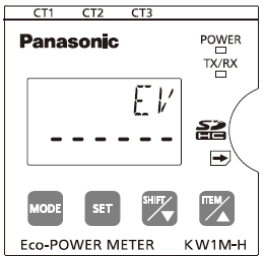
*At present demand or estimated demand, [－－－－－－－－] is displayed upper and lower lines for 1 minute after starting the demand span and when each value exceeds the range.





*[－－－－－－] is displayed lower line until when the next demand span starts, when you change clock to before demand span or to next demand span, or at power failure.

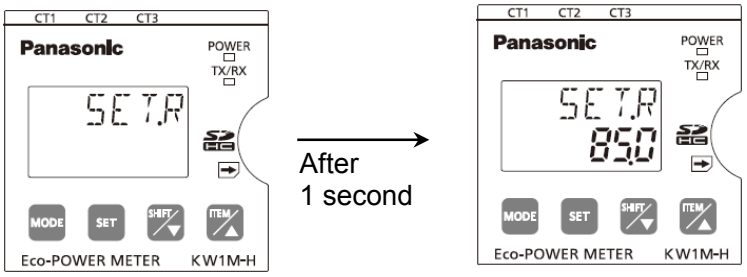




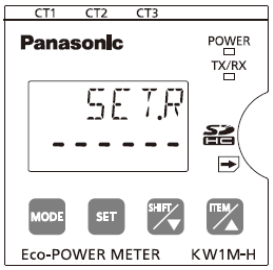
6.4.2 Ratio of estimated demand

・It displays the ratio of estimated demand.
(Estimated demand:2.5kW, Demand setting value:5.0kW -> ratio of estimated demand is 50.0%.)

[Example]



*It displays [－－－－] when demand setting value is set to '0.00kW', when the ratio is over 999.9%, and for 1 minute after starting the demand span.

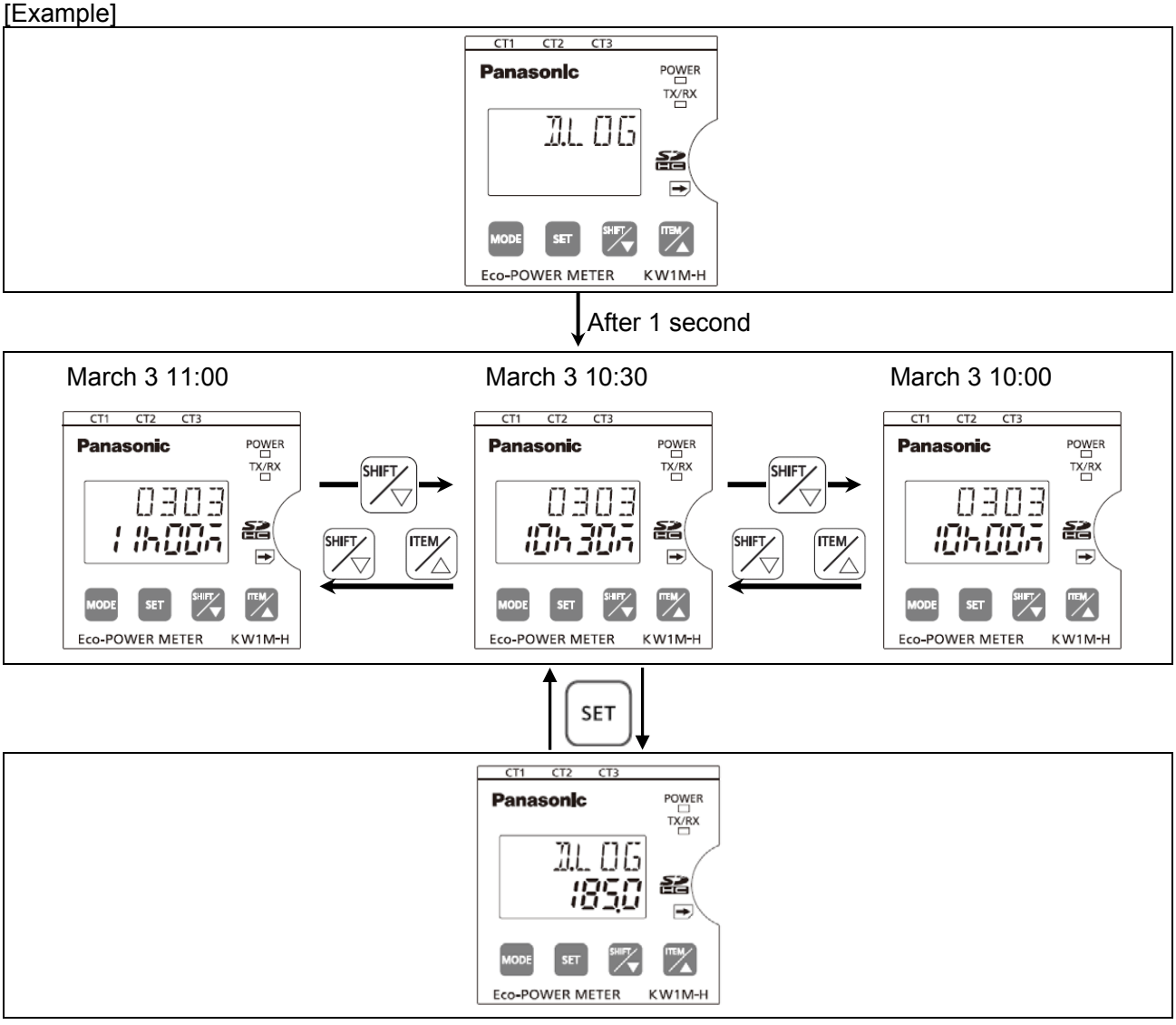


*[－－－－] is displayed until when the next demand span starts, when you change clock to before demand span or to next demand span, or at power failure.

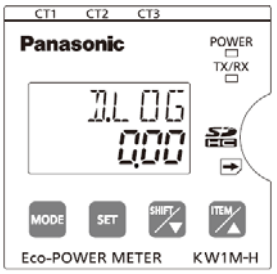
6.4.3 Demand log (D.LOG)

- It displays demand log. You can check a log data of 336 records (last 7 days).
- Press <SHIFT/▽> to change the time.
- Press <SET> to display demand value at time select display. Press <SET> again to return the time select display.

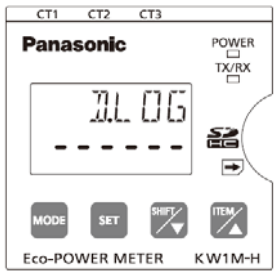
[Example]



*'0.00' is displayed when there is no data for demand.



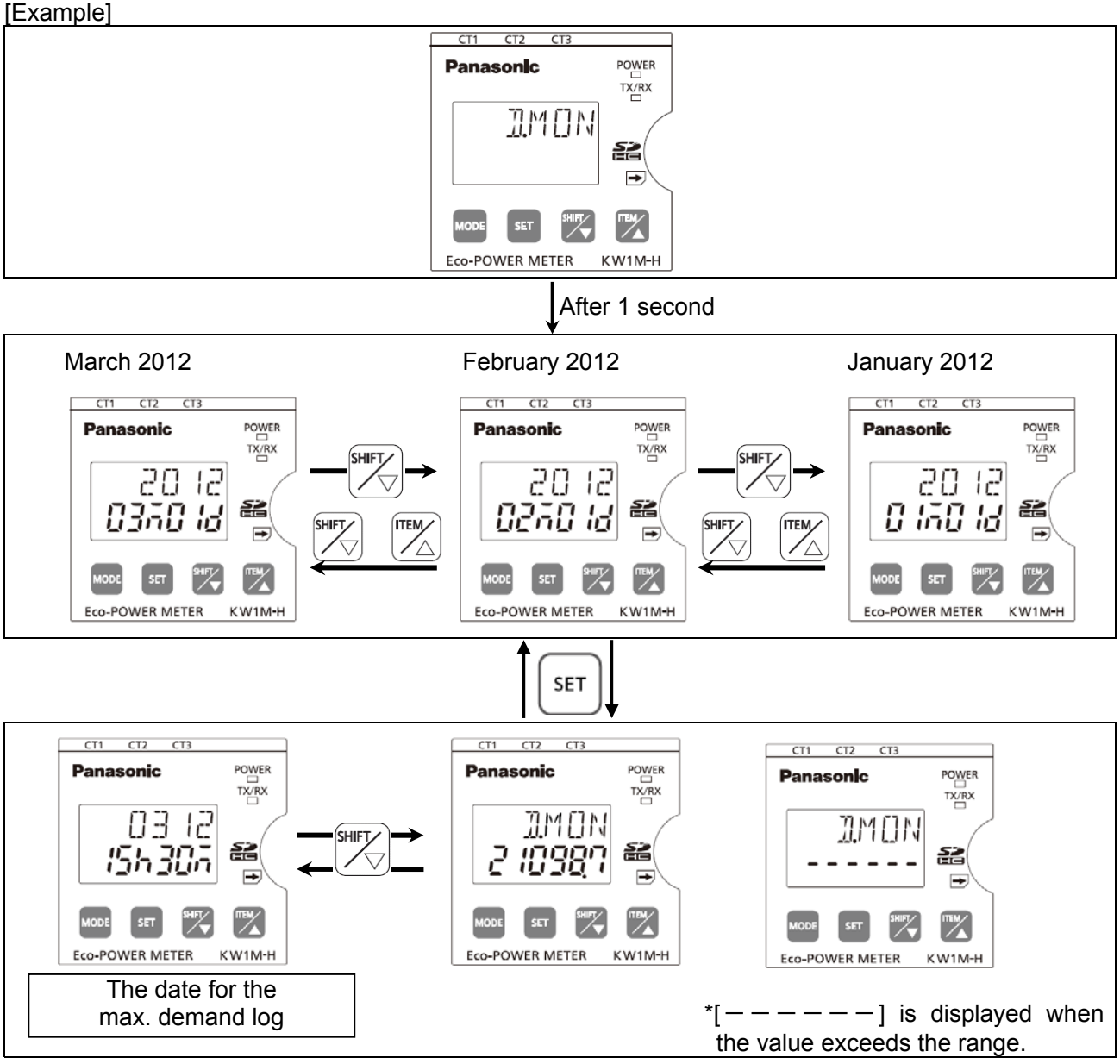
*[－－－－－－] is displayed when demand value exceeds the range.



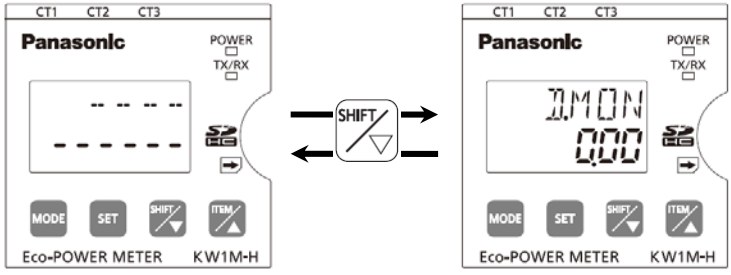
6.4.4 Monthly max. demand log (D.MON)

- You can check the log data for 13 months (max. 13 records).
- Press <SHIFT/▽> to change the month.
- Press <SET> to display demand value at time select display. Press <SET> again to return the time select display.

[Example]



*'0.00' is displayed when there is no data for monthly max demand log and [－－－－－－－－] is displayed for the date.

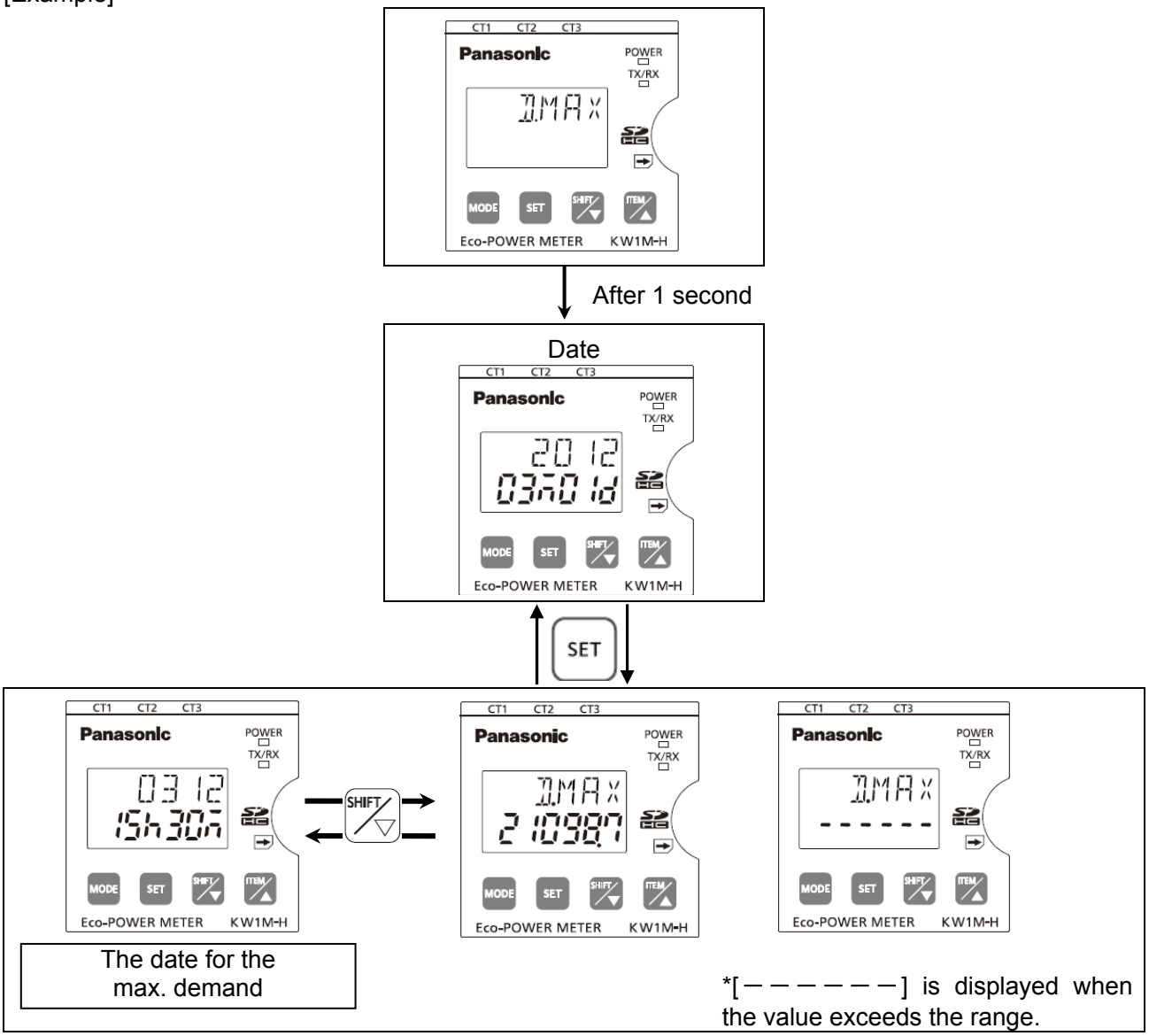


6.4.5 Max. demand (D.MAX)

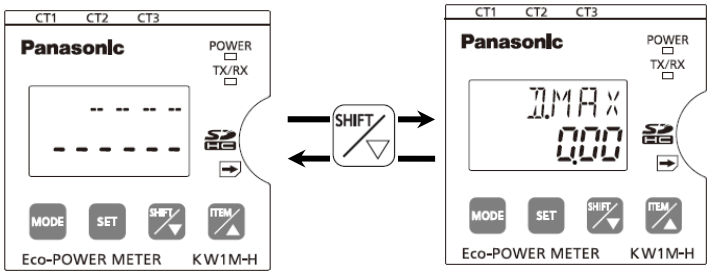
・It displays the maximum demand during the latest 13 months.

・Press <SET> to display demand value at date display. Press <SET> again to return the date display.

[Example]



*'0.00' is displayed when there is no data for max.demand and [－－－－－－] is displayed.

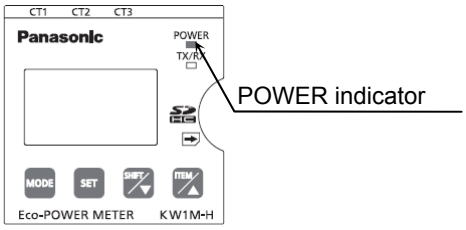


6.5 Other indication

6.5.1 Power On indication

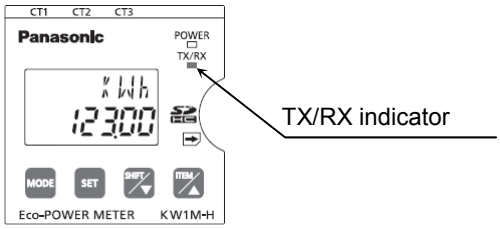
Power indicator turns on when the unit power on.

Even if the display turns off, the power indicator is lighting while a current flows to the unit.
(Refer to Mode 4 setting.)



6.5.2 Indication while communication

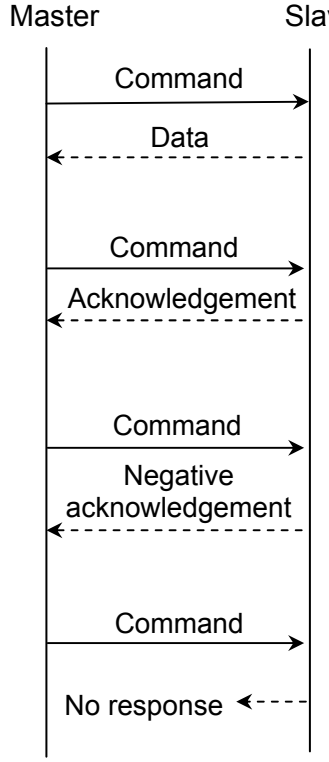
TX/RX indicator is blinking while Eco-POWER METER is under communication.



Chapter 7 Communication

7.1 Communication Procedures

Communication starts with command transmission from the host computer (hereafter Master) and ends with the response of Eco-POWER METER (hereafter Slave).



• Response with data
When master sends reading command, slave responds with the corresponding set value or current status.

• Acknowledgement
When master sends setting command, slave responds by sending the acknowledgement.

• Negative acknowledgement
When master sends a non-existent command or value out of the setting range, the slave returns negative acknowledgement.

• No response
Slave will not respond to master in the following cases.
- Global address 'FF' (MEWTOCOL) is set.
- Broadcast address '00H' (Modbus protocol) is set.
- Communication error (framing error, parity error)
- CRC-16 discrepancy (Modbus RTU mode)

7.2 Communication timing

◆The minimum access time from the master is 1 sec. (Minimum time for update the data)
Eco-POWER METER may not response due to noise and so on, be sure to check that it receives the response from Eco-POWER METER.

◆In order to improve the communication quality, we recommend to send the transmission again.

Communication timing of RS485

◆Eco-POWER METER (Slave) side
When Eco-POWER METER (Slave) starts transmission to RS485 communication line, it is arranged so as to provide an idle status transmission period of about 1 to 99ms (setting available) before sending the response to ensure the synchronization on the receiving side. After sending the response, master can disconnect the transmitter from the communication line within transmission period 20ms.

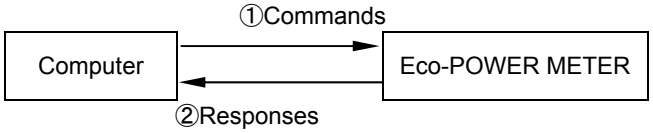
◆Master side (Cautions of setting a program)
At communication, keep the following conditions.
1) Set the program so that the master can disconnect the transmitter from the communication line within the transmission period of about 2ms after sending the command in preparation for reception of the response from Eco-POWER METER (Slave).
2) To avoid collision of transmissions between the master and Eco-POWER METER (Slave), send a next command after checking that the master received the response.

7.3 MEWTOCOL Communication

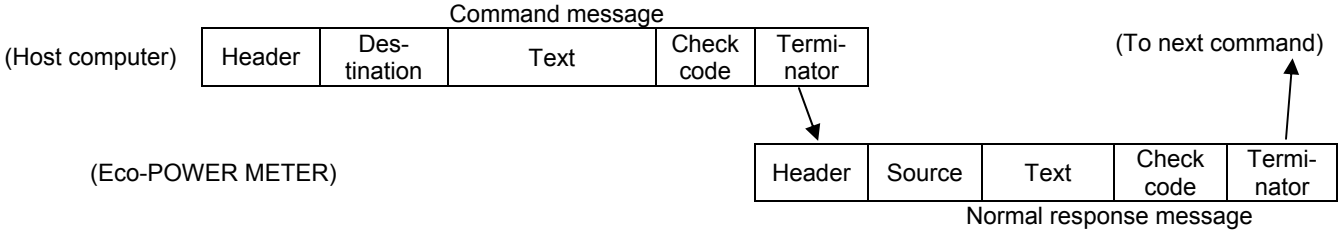
7.3.1 Overview of MEWTOCOL-COM (RS485)

◆Command and response functions

The computer sends commands (instructions) to Eco-POWER METER, and receives responses in return. This enables the computer and Eco-POWER METER to converse with each other, so that various kinds of information can be obtained and provided.



◆Command and response formats



◇Control codes

Name	Character	ASCII code	Explanation
Header	%	25H	Indicates the beginning of a message.
Command	#	23H	Indicates that the data comprises a command message.
Normal response	$	24H	Indicates that the data comprises a normal response message.
Error response	!	21H	Indicates that the data comprises a response message when an error occurs.
Terminator	CR	0DH	Indicates the end of a message.

◇Destination and source AD (H), (L)

Two-digit decimal 01 to 99 (ASCII codes)

Command messages contain a station number for Eco-POWER METER that receives the message.

When FF (ASCII code table) is used, however, the transmission is a global transmission (sent to all stations at once).

Note) When a global transmission is sent, no response to the command message is returned.

◇Block check code Bcc (H), (L)

Two- digit hexadecimal 00 to FF (ASCII codes)

These are codes (horizontal parity) that are used to detect errors in the transmitted data.

If '**' is entered instead of 'Bcc', however, messages can be transmitted without the Bcc. In this case, the Bcc is included with the response

◇Error code Err (H), (L)

Two- digit hexadecimal 00 to FF (ASCII codes)

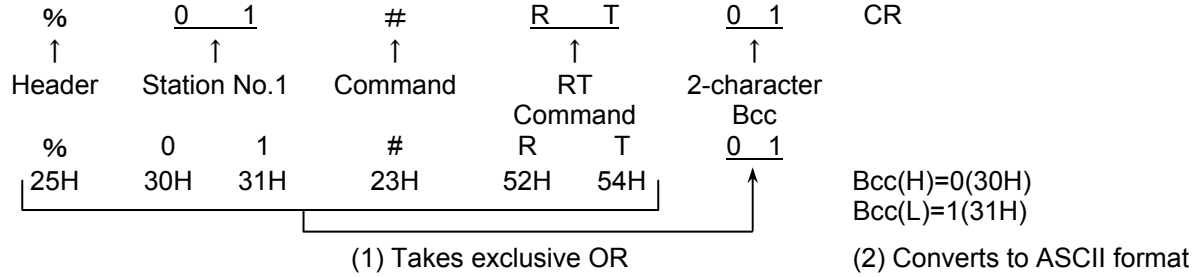
These indicate the content if an error occurs.

◆Bcc (Block Check Code)

-The Bcc is a code that carries out an error check using horizontal parity, to improve the reliability of the data being sent.

-The Bcc uses an exclusive OR from the header (%) to the final character of the text, and converts the 8- bit data into a 2-character ASCII code.

Example)



7.3.2 Data Register List (MEWTOCOL)

Data register	Name	Unit	Kind of data	Range	R/W
DT00001	Contact output status	—	Unsigned 16bit	0;OFF, 1;ON	R
DT00002	Clock correction	—	Unsigned 16bit	0;OFF 1;AUTO 2;MANUAL	R/W
DT00003	Clock correction value	second	Signed 16bit	-48 to 48	R/W
DT00018	Power input type	—	Unsigned 16bit	0;CT(CT input) 1;PM (pulse input)	R/W
DT00019	Pulse type	—	Unsigned 16bit	0;kWh 1;PULSE	R/W
DT00048	Hysteresis for demand alarm off	%	Unsigned 16bit	0 to 100	R/W
DT00049	Demand monitor start time	minute	Unsigned 16bit	1 to 30	R/W
DT00054	Rate (CHG)	0.01	Unsigned 16bit	0 to 9999	R/W
DT00055	Conversion factor (CO_2)	0.001 kg-CO_2	Unsigned 16bit	0 to 9999	R/W
DT00060	CT type	Rated A (rms)	Unsigned 16bit	5,50,100,250,400,600	R/W
DT00061	Unit for Pulse output	—	Unsigned 32bit	1(0.001),10(0.01),100(0.1), 1000(1),10000(10),100000(100) 999 (Instantaneous electric power: Values of DT00064, 00065) 777 (Ratio for current alarm: Value of DT00069) 555 (Preset value for output: Values of DT00158,00159) 333 (Ratio and time for Stand-by alarm: Value of DT00077,00078) 222 (Threshold for demand alarm: Value of DT00205,00206)	R/W
DT00062					
DT00063	Primary side current value when CT 5A	1A	Unsigned 16bit	1 to 4000	R/W
DT00064	Power alarm value (Instantaneous electric power)	0.01kW	Unsigned 32bit	0 to 999999	R/W
DT00065					
DT00066	VT ratio	0.01	Unsigned 16bit	100 to 9999	R/W
DT00067	Current threshold for time measurement	0.1%	Unsigned 16bit	1 to 1000	R/W
DT00068	Cutoff current	0.1%	Unsigned 16bit	10 to 500	R/W
DT00069	Ratio for current alarm	0.1%	Unsigned 16bit	10 to 1000	R/W
DT00070	Voltage range	—	Unsigned 16bit	1; 400V 2; 200V	R/W
DT00071	Calendar Monitor (Hour/Minute)	—	Unsigned 16bit	Higher word Lower word H: 00H to 23H M: 00H to 59H	R
DT00072	Calendar timer (Minute/Second)	—	Unsigned 16bit	Higher word Lower word M: 00H to 59H S: 00H to 59H	R/W
DT00073	Calendar timer (Date/Hour)	—	Unsigned 16bit	Higher word Lower word D: 01H to 31H H: 00H to 23H	R/W
DT00074	Calendar timer (Year/Month)	—	Unsigned 16bit	Higher word Lower word Y: 00H to 99H M: 01H to 12H	R/W
DT00075	Calendar timer (Day)	—	Unsigned 16bit	Higher word Day: 00H to 06H	R/W
DT00076	Log cycle setting	—	Unsigned 16bit	1(1),2(5),3(10),4(15),5(30),6(60)	R/W
DT00077	Ratio for stand-by current	0.1%	Unsigned 16bit	10 to 1000	R/W
DT00078	Time for stand-by alarm	1min.	Unsigned 16bit	0 to 9999	R/W
DT00080	SRAM initialize	—	Unsigned 16bit	0; OFF 1; ON	R/W
DT00081	Saved file type 1	—	Unsigned 16bit	0; OFF 1; ON	R/W
DT00082	Saved file type 2	—	Unsigned 16bit	0; OFF 1; ON	R/W
DT00083	Saved file type 3	—	Unsigned 16bit	0; OFF 1; ON	R/W

Data register	Name	Unit	Kind of data	Range	R/W
DT00100 DT00101	Integrated electric power	0.01kWh	Unsigned 32bit	0 to 999999999	R/W
DT00107	R-current	0.1A	Unsigned 16bit	0 to 60000	R
DT00108	S-current	0.1A	Unsigned 16bit	0 to 60000	R
DT00109	T-current	0.1A	Unsigned 16bit	0 to 60000	R
DT00111	Power factor	0.01	Signed 16bit	-99 to 100	R
DT00112	Frequency	0.1Hz	Unsigned 16bit	0 to 1000	R
DT00118 DT00119	Integrated electric power converted by pulse	0.01kWh	Unsigned 32bit	0 to 999999999	R/W
DT00146	Pulse constant number	—	Unsigned 16bit	0; 50000pulse/kWh 1; 2000pulse/kWh	R/W
DT00147	Reference frequency	0.1Hz	Unsigned 16bit	475 to 630	R/W
DT00150 DT00151	Load ON-time	0.1h	Unsigned 32bit	0 to 999999	R/W
DT00152 DT00153	Load OFF-time	0.1h	Unsigned 32bit	0 to 999999	R/W
DT00154 DT00155	Pulse count value	—	Unsigned 32bit	0 to 999999	R/W
DT00156 DT00157	Pulse rate	0.01kWh	Unsigned 32bit	1 to 100000	R/W
DT00158 DT00159	Preset value	—	Unsigned 32bit	0 to 999999	R/W
DT00160 DT00161	Prescale value	0.001	Unsigned 32bit	0 to 100000	R/W
DT00162	Max. counting speed	Hz	Unsigned 16bit	30, 2000	R/W
DT00163	Auto-off time	min	Unsigned 16bit	0 to 99 (0:always on)	R/W
DT00170 DT00171	R(RS)-voltage	0.1V	Unsigned 32bit	0 to 999999	R
DT00172 DT00173	S(RT)-voltage	0.1V	Unsigned 32bit	0 to 999999	R
DT00174 DT00175	T(TS)-voltage	0.1V	Unsigned 32bit	0 to 999999	R
DT00176 DT00177	Instantaneous electric power	0.01kW	Unsigned 32bit	0 to 999999	R
DT00200 DT00201	Present demand	0.01kW	Unsigned 32bit	0 to 99999999	R
DT00202	Demand remaining time	Minute	Unsigned 16bit	0 to 30	R
DT00203 DT00204	Estimated demand	0.01kW	Unsigned 32bit	0 to 99999999	R
DT00205 DT00206	Demand setting value	0.01kW	Unsigned 32bit	0 to 999999	R/W

Note1) R: Read W: Write

2) Data register except specified is 0.

3) If each setting value is wrote by communication, it memories to internal EEPROM at the same time. Therefore, change setting frequently makes EEPROM's life short. Avoid to usage like this.

4) Write a data within the range when you write it.

5) Max reading point is 26 points (57 bytes), max writing point is 23 points (55 bytes).

6) Unit of data in DT00118 and DT00119 is 0.01kWh. It is different from the display.

7.3.3 Error Codes

◇Basic procedure errors

Error code	Error name	Explanation
40H	Bcc error	・A Bcc error occurred in the command data.
41H	Format error	・A command message was sent that does not fit the transmission format.
42H	No support error	・A command was sent that is not supported.
43H	Procedure error	・Delimiter with multiple frames was sent. ・The response shall be multiple frames.

◇Application error

Error code	Error name	Explanation
60H	Parameter error	・The data code is not 'D'.
61H	Data error	・Word No. is specified without decimal.(0000F etc.) ・The starting word No. is bigger than the ending word No. ・Writing data has a code that is not hexadecimal.
62H	Registration error	・Too many registrations have been entered (more than 17). ・'MD' command was sent when some registration has been exist. ・'MG' command was sent when registration has not been entered.

◇Self-diagnostic error

Error code	Error name	Explanation
45H	Operation error	・At 'WD' command, writing data is exceeded the range of data register.

7.3.4 Command

Eco-POWER METER has 5 kinds of commands.

Command name	Code	Explanation
Read data area	RD	Reads the contents of data area.
Write data to data area	WD	Writes data to a data area.
Resister or Reset data monitored	MD	Resisters the data to be monitored.
Monitoring start	MG	Monitors a registered data.
Read status	RT	Reads the specifications of Eco-POWER METER and error code if an error occurs.

◆[RD]: Read data area (Reads the contents of data area.)

◇Command

%	Destination ×10¹ ×10⁰	#	R	D	D	Starting word No. 5 characters ×10⁴ ×10³ ×10² ×10¹ ×10⁰	Ending word No. 5 characters ×10⁴ ×10³ ×10² ×10¹ ×10⁰	Bcc ×16¹ ×16⁰	CR

◇Normal response (Read successful)

%	Source ×10¹ ×10⁰	$	R	D	First register contents 4 characters ×16¹ ×16⁰ ×16³ ×16²	Last register contents 4 characters ×16¹ ×16⁰ ×16³ ×16²	Bcc ×16¹ ×16⁰	CR

(lower word) (higher word) (lower word) (higher word)

◇Error response

%	Source ×10¹ ×10⁰	!	Error code ×16¹ ×16⁰	Bcc ×16¹ ×16⁰	CR

(Common to each command)

◆[WD]: Write data area (Writes date to a data area.)

◇Command

%	Destination ×10¹ ×10⁰	#	W	D	D	Starting word No. 5 characters ×10⁴ ×10³ ×10² ×10¹ ×10⁰	Ending word No. 5 characters ×10⁴ ×10³ ×10² ×10¹ ×10⁰	First writing data 4 characters ×16¹ ×16⁰ ×16³ ×16²	⇒

(lower word) (higher word)

◇Normal response (Write successful)

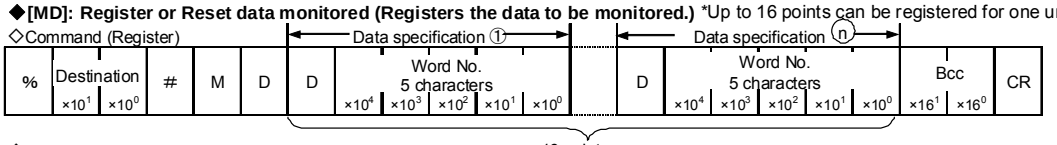
%	Source ×10¹ ×10⁰	$	W	D	Bcc ×16¹ ×16⁰	CR

⇒	Last writing data 4 characters ×16¹ ×16⁰ ×16³ ×16²	Bcc ×16¹ ×16⁰	CR

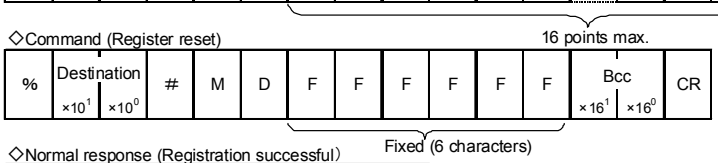
(lower word) (higher word)

◆[MD]: Register or Reset data monitored (Registers the data to be monitored.) *Up to 16 points can be registered for one unit.

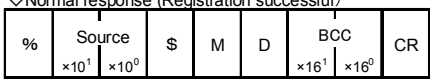
◇Command (Register)


Data specification ①
Data specification n
% Destination ×10¹ ×10⁰ # M D D Word No. 5 characters ×10⁴ ×10³ ×10² ×10¹ ×10⁰ D Word No. 5 characters ×10⁴ ×10³ ×10² ×10¹ ×10⁰ Bcc ×16¹ ×16⁰ CR

◇Command (Register reset)

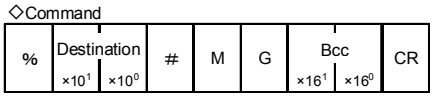


◇Normal response (Registration successful)

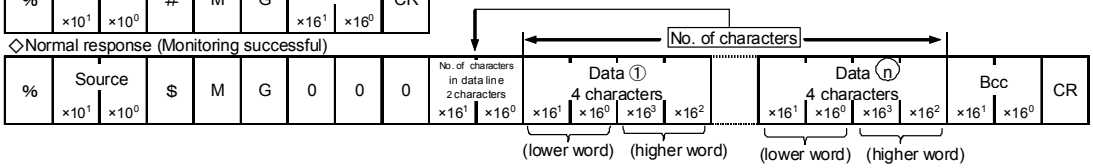


◆[MG]: Monitoring start (Monitors a registered data.)

◇Command



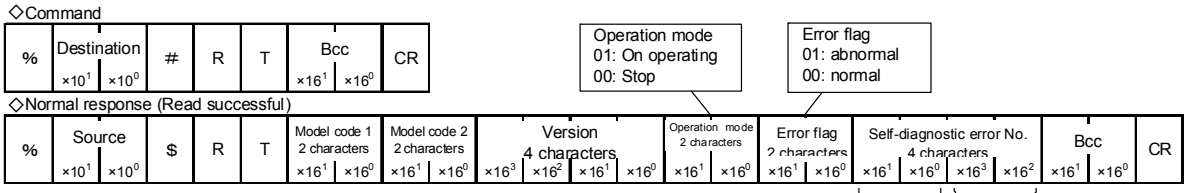
◇Normal response (Monitoring successful)


No. of characters
% Source ×10¹ ×10⁰ $ M G 0 0 0 No. of characters in data line 2 characters ×16¹ ×16⁰ Data ① 4 characters ×16¹ ×16⁰ ×16³ ×16² Data n 4 characters ×16¹ ×16⁰ ×16³ ×16² Bcc ×16¹ ×16⁰ CR
(lower word) (higher word) (lower word) (higher word)

◆[RT]: Read the status of Eco-POWER METER (Reads the specifications of Eco-POWER METER and error codes if an error occurs.)

◇Command

◇Normal response (Read successful)


Operation mode 01: On operating 00: Stop
Error flag 01: abnormal 00: normal
% Source ×10¹ ×10⁰ $ R T Model code 1 2 characters ×16¹ ×16⁰ Model code 2 2 characters ×16¹ ×16⁰ Version 4 characters ×16³ ×16² ×16¹ ×16⁰ Operation mode 2 characters ×16¹ ×16⁰ Error flag 2 characters ×16¹ ×16⁰ Self-diagnostic error No. 4 characters ×16¹ ×16⁰ ×16³ ×16² Bcc ×16¹ ×16⁰ CR
(lower word) (higher word)

*With this unit, it responses "99" for Model code1, "14" for Model code2.

7.4 MODBUS (RTU) Communication

7.4.1 Overview of MODBUS (RTU)

◆8-bit binary data in command is transmitted as it is.

Data format	Start bit	: 1 bit
	Data bit	: 8 bits *7bits is not available.
	Parity	: No parity, Even parity, Odd parity Selectable
	Stop bit	: 1 bit (Fixed)
	Error detection	: CRC-16 (Cyclic Redundancy Check)
	Data interval	: 3.5 character transmission time or less

◆Message configuration

RTU mode is configured to start after idle time processing of more than 3.5 character transmissions and end after idle time processing of more than 3.5 character transmissions.

3.5 idle characters	Slave address	Function code	Data	Error check CRC-16	3.5 idle characters
	8-bit	8-bit	∗ ∗ bits	16-bit	

Master judges the transmission complete after no command for 4-characters idle time and process the command.

*Transmission speed and judgment time to complete transmission

Transmission speed (bps)	Judgment time to complete (ms)
38400	about 1.00
19200	about 2.00
9600	about 4.00
4800	about 8.00
2400	about 16.00

◇Slave address:

Slave address is an individual instrument number on the slave side and is set within the range 1 to 99 (01H to 63H). Master identifies slaves by the slave address of the requested message.

Slave informs master which slave is responding to master by placing its own address in the response message. Slave address 0 (00H, broadcast address) can identify all slaves connected. However slaves do not respond.

◇Function code: Function code is command code for the slave to undertake the following action types.

Function code	Contents
03(03H)	DT Read
06(06H)	DT 1 word write
16(10H)	DT several data write

Function code is used to discern whether the response is normal (acknowledgement) or if any error (negative acknowledgement) has occurred when slave returns response message to master.

When acknowledgement is returned, slave simply returns original function code. When negative acknowledgement is returned, MSB of original function code is set as 1 for response.

For example, when the master sends request message setting 00H to function code by mistake, slave returns 80H by setting MSB to 1, because the former is an illegal function.

For negative acknowledgement, the exception codes below are set to data of response message and returned to master in order to inform it of what kind of error has occurred.

Exception code	Contents
1(01H)	Illegal Function (Non-existent function)
3(03H)	Illegal data value (Value out of the devise numbers)

note1) Even if it commands to write (06H.10H) to non-existent data address, slave response with acknowledgement. However, it doesn't write.

note2) Even if it commands to write the value out of the setting range, slave response with acknowledgement. However, it doesn't write.

note3) The maximum number of reading slaves is 26 (57 bytes), the maximum number of writing slaves is 23 (55 bytes).

◇Data: Data depends on the function code.
A request message from the master side is composed of data item, number of data and setting data.
A response message from the slave side is composed of number of bytes, data and exception code in negative acknowledgement.

◇Error check: 16-bit data to detect communication errors. Refer to the next.

◇Acknowledgement response
When command is to write 1 point, same massage of command is responded.
When command is to write several points, part of command message (6 bytes) is responded.

◆Error check
After calculating CRC-16 (Cyclic Redundancy Check) from slave address to the end of data, the calculated 16-bit data is appended to the end of message in sequence from low order to high order.

<How to calculate CRC>
In CRC system, the information is divided by the polynomial series. The remainder is added to the end of the information and transmitted. The generation of polynomial series is as follows.
(Generation of polynomial series: $X^{16} + X^{15} + X^{2} + 1$)

1) Initialize the CRC-16 data (assumed as X) (FFFFH).
2) Calculate exclusive OR (XOR) with the 1st data and X. This is assumed as X.
3) Shift X one bit to the right. This is assumed as X.
4) When a carry is generated as a result of the shift, XOR is calculated by X of 3) and the fixed value (A001H). This is assumed as X. If a carry is not generated, go to step 5).
5) Repeat steps 3) and 4) until shifting 8 times.
6) XOR is calculated with the next data and X. This is assumed as X.
7) Repeat steps 3) to 5).
8) Repeat steps 3) to 5) up to the last data.
9) Set X as CRC-16 to the end of message in sequence from low order to high order.

◆Message example
<1> Reading electricity rate (0036H) of address 1
・Command

3.5 idle characters	Slave address (01H)	Function code (03H)	Data item (0036H)	Number of data (0001H)	Error check CRC-16 (6404H)	3.5 idle characters
	1	1	2	2	2	←character number

・Response message from slave in normal status (When Rate=1000(10.00) [03E8H])

3.5 idle characters	Slave address (01H)	Function code (03H)	Number of response byte (02H)	Number of data (03E8H)	Error check CRC-16 (B8FAH)	3.5 idle characters
	1	1	1	2	2	←character number

<2> Setting electricity rate (0036H) of address 1 (When rate is set to 20.00(2000) [07D0H])
・Command

3.5 idle characters	Slave address (01H)	Function code (06H)	Data item (0036H)	Number of data (07D0H)	Error check CRC-16 (6A68H)	3.5 idle characters
	1	1	2	2	2	←character number

・Response message from slave in normal status

3.5 idle characters	Slave address (01H)	Function code (06H)	Data item (0036H)	Number of data (07D0H)	Error check CRC-16 (6A68H)	3.5 idle characters
	1	1	2	2	2	←character number

<3> Reset integrated electric power (0064H, 0065H:2-word) of address 1

(When setting to 0 [0000, 0000H])

・Command

3.5 idle characters	Slave address (01H)	Function code (10H)	Data item (0064H)	Number of data item to write (0002H)	Number of data (04H)	⇒
	1	1	2	2	1	←character number

⇒	Data 1 (0000H)	Data 2 (0000H)	Error check CRC-16 (F474H)	3.5 idle characters
	2	2	2	←character number

・Response message from slave in normal status

3.5 idle characters	Slave address (01H)	Function code (10H)	Data item (0064H)	Number of data item to write (0002H)	Error check CRC-16 (0017H)	3.5 idle characters
	1	1	2	2	2	←character number

・A response message from the slave in exception (error) status

(When number of data has been mistaken.)

Function code MSB is set to 1 for the response message in exception (error) status (90H).
The exception code 03H (Value out of the devise numbers) is returned as contents of error.

<Mistaken message example (Command)>

3.5 idle characters	Slave address (01H)	Function code (10H)	Number of data item to write (0002H)	Number of data ***(06H)***	⇒
				↑ **Mistake**	

⇒	Data 1 (0000H)	Data 2 (0000H)	Error check CRC-16 (8F8E)	3.5 idle characters

<Response message from slave to mistaken command
(Response message in exception (error) status)>

3.5 idle characters	Slave address (01H)	Function code (90H)	Exception code (03H)	Error check CRC-16 (0C01H)	3.5 idle characters

7.4.2 Data Register List

Data item (MEWTOCOL)	Name	Unit	Kind of data	Range: Hexadecimal (Range: Decimal)	MODBUS Function code
0001H (DT00001)	Contact output status	–	Unsigned 16bit	0H(0);OFF,1H(1);ON	03H
0002H (DT00002)	Clock correction	–	Unsigned 16bit	0H(0);OFF 1H(1);AUTO 2H(2);MANUAL	03H/06H/10H
0003H (DT00003)	Clock correction value	second	Signed 16bit	FFD0H to 30H (-48 to 48)	03H/06H/10H
0012H (DT00018)	Power input type	–	Unsigned 16bit	0H(0);CT(CT input) 1H(1);PM (pulse input)	03H/06H/10H
0013H (DT00019)	Pulse type	–	Unsigned 16bit	0H(0);kWh 1H(1);PULSE	03H/06H/10H
0030H (DT00048)	Hysteresis for demand alarm off	%	Unsigned 16bit	0H to 64H (0 to 100)	03H/06H/10H
0031H (DT00049)	Demand monitor start time	minute	Unsigned 16bit	1H to 1EH (1 to30)	03H/06H/10H
0036H (DT00054)	Rate (CHG)	0.01	Unsigned 16bit	0H to 270FH (0 to 9999)	03H/06H/10H
0037H (DT00055)	Conversion factor (CO2)	0.001 kg-CO_2	Unsigned 16bit	0H to 270FH (0 to 9999)	03H/06H/10H
003CH (DT00060)	CT type	Rated A (rms)	Unsigned 16bit	5H(5), 32H(50), 64H(100), FAH(250), 190H(400), 258H(600)	03H/06H/10H
003DH<LSB> (DT00061)	Unit for Pulse output	–	Unsigned 32bit	1H(1)<0.001>, AH(10)<0.01>, 64H(100)<0.1>, 3E8H(1000)<1>, 2710H(10000)<10>, 186A0H(100000)<100>, 3E7H(999) <Instantaneous electric power: Values of 0040H,0041H> 309H(777) <Ratio for current alarm: Values of 0045H> 22B(555) <Preset value for output: Values of 009EH,009FH> 14DH(333) <Ratio and time for stand-by alarm: Values of 004DH,00E4H> DEH(222) <Threshold for demand alarm: Value of 00CDH,00CEH>	03H/06H/10H
003EH<MSB> (DT00062)					
003FH (DT00063)	Primary side current value when CT 5A	1A	Unsigned 16bit	1H to FA0H (1 to 4000)	03H/06H/10H
0040H<LSB> (DT00064)	Power alarm value (Instantaneous active power)	0.01kW	Unsigned 32bit	0H to F423FH (0 to 999999)	03H/06H/10H
0041H<MSB> (DT00065)					
0042H (DT00066)	VT ratio	0.01	Unsigned 16bit	64H to 270FH (100 to 9999)	03H/06H/10H
0043H (CT00067)	Current threshold for time measurement	0.1%	Unsigned 16bit	1H to 3E8H (1 to 1000)	03H/06H/10H
0044H (DT00068)	Cutoff current	0.1%	Unsigned 16bit	AH to 1F4H (10 to 500)	03H/06H/10H
0045H (DT00069)	Current alarm value	0.1%	Unsigned 16bit	AH to 3E8H (10 to 1000)	03H/06H/10H

Data item (MEWTOCOL)	Name	Unit	Kind of data	Range: Hexadecimal (Range: Decimal)	MODBUS Function code
0046H (DT00070)	Voltage range	—	Unsigned 16bit	1H(1):400V, 2H(2):200V	03H/06H/10H
0047H (DT00071)	Calendar Monitor (Hour/Minute)	—	Unsigned 16bit	H:00H to 23H, M:00H to 59H	03H
0048H (DT00072)	Calendar timer (Minute/Second)	—	Unsigned 16bit	M:00H to 59H, S:00H to 59H	03H/06H/10H
0049H (DT00073)	Calendar timer (Date/Hour)	—	Unsigned 16bit	D:01H to 31H, H:00H to 23H	03H/06H/10H
004AH (DT00074)	Calendar timer (Year/Month)	—	Unsigned 16bit	Y:00H to 99H, M:01H to 12H	03H/06H/10H
004BH (DT00075)	Calendar timer (Day)	—	Unsigned 16bit	Day:00H to 06H	03H/06H/10H
004CH (DT00076)	Log cycle setting	—	Unsigned 16bit	1H(1)<1>,2H(2)<5>, 3H(3)<10>,4H(4)<15>, 5H(5)<30>,6H(6)<60>	03H/06H/10H
004DH (DT00077)	Current ratio for stand-by alarm	0.1%	Unsigned 16bit	AH to 3E8H (10 to 1000)	03H/06H/10H
004EH (DT00078)	Time for stand-by Alarm	—	Unsigned 16bit	1H to 270FH (1 to 9999)	03H/06H/10H
0050H (DT00080)	SRAM Initialize	—	Unsigned 16bit	0H(0)<OFF>,1H(1)<ON>	03H/06H/10H
0051H (DT00081)	Saved file type 1	—	Unsigned 16bit	0; OFF 1; ON	03H/06H/10H
0052H (DT00082)	Saved file type 2	—	Unsigned 16bit	0; OFF 1; ON	03H/06H/10H
0053H (DT00083)	Saved file type 3	—	Unsigned 16bit	0; OFF 1; ON	03H/06H/10H
0064H<LSB> (DT00100) 0065H<MSB> (DT00101)	Integrated electric Power	0.01kWh	Unsigned 32bit	0H to 3B9AC9FFH (0 to 999999999)	03H/06H/10H
006BH (DT00107)	R-current	0.1A	Unsigned 16bit	0H to EA60H (0 to 60000)	03H
006CH (DT00108)	S-current	0.1A	Unsigned 16bit	0H to EA60H (0 to 60000)	03H
006DH (DT00109)	T-current	0.1A	Unsigned 16bit	0H to EA60H(0 to 60000)	03H
006FH (DT00111)	Power factor	0.01	Signed 16bit	FF9DH to 0064H (-99 to 100)	03H
0070H (DT00112)	Frequency	0.1Hz	Unsigned 16bit	0H to 3E8H (0 to 1000)	03H
0076H<LSB> (DT00118) 0077H<MSB> (DT00119)	Integrated electric power converted by pulse	0.01kWh	Unsigned 32bit	0H to 3B9AC9FFH (0 to 999999999)	03H/06H/10H
0092H (DT00146)	Pulse constant number	—	Unsigned 16bit	0H(0); 50000pulse/kWh 1H(1); 2000pulse/kWh	03H/06H/10H
0093H (DT00147)	Reference frequency	0.1Hz	Unsigned 16bit	1DBH to 276H (475 to 630)	03H/06H/10H
0096H<LSB> (DT00150) 0097H<MSB> (DT00151)	Load ON-time	0.1h	Unsigned 32bit	0H to F423FH (0 to 999999)	03H/06H/10H
0098H<LSB> (DT00152) 0099H<MSB> (DT00153)	Load OFF-time	0.1h	Unsigned 32bit	0H to F423FH (0 to 999999)	03H/06H/10H

Data item (MEWTOCOL)	Name	Unit	Kind of data	Range: Hexadecimal (Range: Decimal)	MODBUS Function code
009AH<LSB> (DT00154) 009BH<MSB> (DT00155)	Pulse count value	–	Unsigned 32bit	0H to F423FH (0 to 999999)	03H/06H/10H
009CH<LSB> (DT00156) 009DH<MSB> (DT00157)	Pulse rate	0.001kWh	Unsigned 32bit	1H to 186A0H (1 to 100000)	03H/06H/10H
009EH<LSB> (DT00158) 009FH<MSB> (DT00159)	Preset value	–	Unsigned 32bit	0H to F423FH (0 to 999999)	03H/06H/10H
00A0H<LSB> (DT00160) 00A1H<MSB> (DT00161)	Prescale value	0.001	Unsigned 32bit	0H to 186A0H (0 to 100000)	03H/06H/10H
00A2H (DT00162)	Max. counting speed	Hz	Unsigned 16bit	1EH (30), 7D0H (2000)	03H/06H/10H
00A3H (DT00163)	Auto-off time	min	Unsigned 16bit	0H to 63H (0 to 99) (0H:always on)	03H/06H/10H
00AAH<LSB> (DT00170) 00ABH<MSB> (DT00171)	R(RS)-voltage	0.1V	Unsigned 32bit	0H to F423FH (0 to 999999)	03H
00ACH<LSB> (DT00172) 00ADH<MSB> (DT00173)	S(RT)-voltage	0.1V	Unsigned 32bit	0H to F423FH (0 to 999999)	03H
00AEH<LSB> (DT00174) 00AFH<MSB> (DT00175)	T(TS)-voltage	0.1V	Unsigned 32bit	0H to F423FH (0 to 999999)	03H
00B0H<LSB> (DT00176) 00B1H<MSB> (DT00177)	Instantaneous electric power	0.01kW	Unsigned 32bit	0H to F423FH (0 to 999999)	03H
00C8H<LSB> (DT00200) 00C9H<MSB> (DT00201)	Present demand	0.01kW	Unsigned 32bit	0H to 5F5E0FFH (0 to 99999999)	03H
00CAH (DT00202)	Demand remaining time	Minute	Unsigned 16bit	0H to 001EH (0～30)	03H
00CBH<LSB> (DT00203) 00CCH<MSB> (DT00204)	Estimated demand	0.01kW	Unsigned 32bit	0H to 5F5E0FFH (0 to 99999999)	03H
00CDH<LSB> (DT00205) 00CEH<MSB> (DT00206)	Demand setting value	0.01kW	Unsigned 32bit	0H to F423FH (0 to 999999)	03H/ 06H/10H

<LSB>: Least Significant Byte
<MSB>: Most Significant Byte

Note1) 03H: Read 06H,10H: Write
2) Data register except specified is 0.
3) If each setting value is wrote by communication, it memories to internal EEPROM at the same time. Therefore, change setting frequently makes EEPROM's life short. Avoid to usage like this.
4) Write a data within the range when you write it.
5) Max reading point is 26 points (57 bytes), max writing point is 23 points (55 bytes).
6) Unit of data in 0076H and 0077H is 0.01kWh. It is different from the display.

Chapter 8 Specifications

8.1 Main unit

Rated operating voltage	100-240V AC	
Rated frequency	50/60Hz common	
Rated power consumption	8VA (240VAC at 25℃)	
Inrush current	Max. 30A (240VAC at 25℃)	
Allowable operating voltage range	85 to 264V AC (85 to 110% of rated operating voltage)	
Allowable momentary power-off time	10ms	
Ambient temperature	-10 to +50℃ (-25 to +70℃ at storage)	
Ambient humidity	30 to 85%RH (at 20℃ non-condensing)	
Breakdown voltage(initial)	Between the isolated circuits: 2000V for 1min	A)Outer edge (enclosure) －All terminals B)Between Insulated circuit ・Operating power supply terminals－Analog input terminals ・Operating power supply terminals－Pulse input terminal ・RS485－All other terminals ・Pulse output terminals－All other terminals
Insulation resistance(initial)	Between the isolated circuits: 100MΩor more (measured at 500V DC)	
Vibration resistance	10 to 55Hz (1cycle/min) single amplitude : 0.375mm(1h on 3 axes)	
Shock resistance	Min. 294m/s^2 (5 times on 3 axes)	
Display method	LCD with backlight Upper: Green Lower: Amber	4-digit, 16-segment, letters H: 6.5mm 6-digit, 7-segment, letters H: 7.5mm
Power failure memory method	EEPROM (more than 100,000 overwrite)	Memory items: Setting value Measuring value
Size	75 x 90 x 50 mm	
Weight	approx.180g (without battery)	

note1) Analog input terminals: No.4, No.5 and No. 6

8.2 Input Specifications

8.2.1 Electric power input

Phase and wire system		Single-phase two-wire system Single-phase three-wire system Three-phase three-wire system Three-phase four-wire system (common)
Input voltage	Rating	Single-phase two-wire : 0-440V AC (Line voltage) Single-phase three-wire : 0-220V AC (Phase voltage) Three-phase three-wire : 0-440V AC (Line voltage) Three-phase four-wire : 0-254V AC (Phase voltage)
	Allowable measurement voltage	Up to 120% of rated input voltage Single-phase two-wire : 0-528V AC (Line voltage) Single-phase three-wire : 0-264V AC (Phase voltage) Three-phase three-wire : 0-528V AC (Line voltage) Three-phase four-wire : 0-300V AC (Phase voltage)
	VT ratio	1.00 to 99.99 (Set with setting mode) ***Voltage transformer (VT) is required when you measure a load with voltage over 440VAC (Allowable measurement voltage).** ***Secondary voltage rating of VT is 110V.**
Input current	Primary side rating	<Using the dedicated CT> ・5A/50A/100A/250A/400A/600A (Select with setting mode) <Using a CT with the secondary side current 5A> ・1 to 4000A (Set with setting mode) ***Use a CT with secondary side current of 5A when measure 600A or more.**

Special functions	Cut-off current	1.0 to 50.0%F.S (Set with setting mode)
	Cut-off voltage	Below 5% of rating voltage (Rating voltage x 0.05 x VT ratio) (Fixed)
	Current threshold for hour meter	1.0 to 100.0%F.S.
Accuracy (without error in CT and VT)	Indication accuracy	Instantaneous electric power / Integrated electric power / Electricity charge / Conversion value
		Within ± (2.0 % F.S. + 1 digit) (at 20 °C, rated input, rated frequency, power factor 1) In case of 5 A CT mode, within ± (2.5 % F.S. + 1 digit) ***Accuracy coverage:5 to 100% of rated current**
		Current
		Within ± (1.0 % F.S. + 1 digit) In case of 5 A CT mode, within ± (2.5 % F.S. + 1 digit) (at 20 °C rated input, rated frequency, power factor 1) ***Accuracy coverage: 5 to 100 % of rated current**
		Voltage
		Within ± (1.0 % F.S. + 1 digit) (at 20 °C rated input, rated frequency, power factor 1)
		Hour meter
		±(0.01%+1digit) (at 20℃) Monthly accuracy: ±260 sec.(for your reference) 〔In case power on start or current energizing ±(0.01%+1s+1 digit) (at 20℃)〕
	Temperature characteristics	Within ± (1.0 % F.S.+ 1 digit) In case of 5 A CT mode, within ± (1.5 % F.S. + 1 digit) (Range of -10 to 50 °C, rated input, power factor 1)
	Frequency characteristics	Within ± (1.0 % F.S. + 1 digit) In case of 5 A CT mode, within ± (1.5 % F.S. + 1 digit) (Frequency change ± 5 % based on rated frequency, rated input, power factor 1)

8.2.2 Pulse input

Input mode		Addition (Fixed)
Max. counting speed		2kHz /30Hz (Select with setting mode)
Pulse input		Min. input signal width: 0.25ms (When 2kHz selected) /16.7ms (When 30Hz selected) ON:OFF ratio = 1 : 1
Input signal		Contact / No contact (open collector) ・Impedance when shorted: Max. 1kΩ ・Residual voltage when shorted: Max. 2V ・Impedance when open: Min. 100kΩ
Output mode		HOLD (Over count)
Prescale	Decimal point	under 3-digit
	Range	0.001 to 100.000 (Set with setting mode)

8.2.3 Pulse for demand monitor input

Input method	Non-voltage pulse input or open-collector input
Pulse constant number	50,000(pulse/kWh) / 2,000(pulse/kWh)
Min. input signal width	0.25ms (When 2kHz selected) /16.7ms (When 30Hz selected)
Pulse rate	0.001 to 100.000 kWh/1pulse

8.3 Output Specifications

8.3.1 Pulse output (Transistor output)

Number of output point	1 point
Insulation method	Optical coupler
Output type	Open collector
Output capacity	100mA 30V DC
Pulse width	approx. 100ms
ON state voltage drop	1.5V or less
OFF state leakage current	100 μA or less
Pulse output unit	0.001/0.01/0.1/1/10/100kWh/Alarm(AL-P)/ Current alarm(AL-C) /Stand-by alarm (AL-S) /Counter(Cnt) / Demand alarm(DEM) (Selectable with setting mode)

* We recommend the setting of minimum unit for pulse output for measurement shown as below.
Output pulse: 4-pulse or less per 1sec.
How to calculate
(Unit for pulse output: PL-P)＞(Max. measurement power [kW])／(3600[s]×4 [pulse/s])

Note (1) Improper unit setting may cause miss counting.
(2) If the OFF time is too short, there is a possibility of counting errors.

8.4 Communication Specifications

Interface		Conforming to RS485
Protocol		MEWTOCOL/MODBUS(RTU) (selectable with setting mode)
Isolation status		Isolated with the internal circuit
Number of connected units		99 (max.) *2 *3
Transmission distance		1200m (max.) *1
Transmission speed		38400/19200/9600/4800/2400bps (selectable with setting mode)
Transmission Format	Data length	8bit/7bit (selectable with setting mode) *4
	Parity	Not available / Odd number / Even number (selectable with setting mode)
	Stop bit	1bit (fixed)
Communication method		Half-duplex
Synchronous system		Asynchronous communication method
Ending resistance		approx. 120Ω (built-in)

*1 Please check with the actual devices when some commercial devices with RS485 interface are connected. The number of connected devices, transmission distance, and transmission speed may be different according to using transmission line.
*2 For RS485 converter on the computer side, we recommend SI-35 and SI-35USB (from LINE EYE Co.,Ltd.).
*3 When using SI-35,SI-35USB or PLC from our company (which can be connected up to 99 units), up to 99 Eco-POWER METER can be connected. In case using this system with the other devices, up to 31 Eco-POWER METER can be connected.
*4 With MODBUS(RTU) protocol, it works only with 8bit.

8.5 Main Unit Memory Specifications

Logging Function

File type 1 (Instantaneous value) *1	Save cycle	60 minutes (Just at every hour) (fixed)
	Saved data	(Instantaneous value) Integrated electric power, Instantaneous electric power, Current, Voltage, Power factor, Frequency, Count value
	Saved data amount	24 records for 1 file (Max 1.5 years)
File type 2 (Difference value) *1	Save cycle	60 minutes (Just at every hour) (fixed)
	Saved data	(Difference value) Integrated electric power, Count value
	Saved data amount	24 records for 1 file (Max 1.5 years)
File type 3 (Detail instantaneous value) *1	Save cycle	Selectable from 1min, 5min, 10min, 15min, 30min, 60min. (Saved timing) 1min selected: Just at every minute 5min selected: 00,05,10,15,20,25,30min・・・of every hour 10min selected: 00,10,20,30,40,50min of every hour 15min selected: 00,15,30,45min of every hour 60min selected: Just at every hour
	Saved data	(Instantaneous value) Integrated electric power, Instantaneous electric power, Current, Voltage, Power factor, Frequency, Count value Electric power converted by pulse, Present demand, Load ON-time, Load OFF-time
	Saved data amount	Max. 5760 records about 4 days (In case of 1 min of save cycle)
Display		Monthly integrated electric power (Latest 18 months) Daily integrated electric power (Latest 30 days) Hourly integrated electric power (Latest 24 hours)

Calendar timer	Time accuracy *2 ・with clock correction Synchronize with frequency of measured voltage *3 ・without clock correction (Monthly accuracy) ±240 seconds (at -10℃) ±70 seconds (at 25℃) ±240 seconds (at 50℃)
Backup contents by battery	Time measurement and log data storage
Battery life *4	About 2 years (at 25℃) (when no power)

*1 You can select if the data of file type 1,2 and 3 is written to SD memory card with the setting mode.

*2 With using clock correction function, it synchronizes with the measured voltage (50Hz/60Hz) automatic recognition and corrects the clock. In case of a power failure, it measures time by using the internal clock and backup battery. In this case the accuracy is applied to the accuracy without clock correction.
You can select if it corrects a clock or not with the setting mode.

*3 The reference frequency for using the time synchronizes is the frequency of measured voltage input to P1-P0 terminals. It doesn't correct the time when P1-P0 terminals are not connected. In case of that it detects an abnormal for the reference frequency; it will shift to the internal clock. When it detects a normal frequency after that, it synchronizes with the frequency of measured voltage and corrects the time.

*4 When battery power is reduced, 'BATT' is blinking. Replace battery according to the procedures.
Battery life will be short if using this under high-temperature.

8.6 External Memory Specifications

●SD memory card slot

Support media	SD memory card	*1
Applied format standard	SD and SDHC standard	*2

*1 Confirmed manufacturer: Panasonic Co. 2GB, 4GB, 8GB

*2 UHS standard is not supported.

When using SD memory card that is not confirmed, it has a possibility that it can't write the logging data.

<Care for handling SD memory card>

Be sure to format before using. In order to format SD memory card, use Panasonic format software. You can download from Panasonic website.
File system of SD memory card formatted by PC's software is not supported SD memory card standard generally.

In the following cases, there is a possibility to lose the saved data in SD memory card.
Please understand us beforehand; we don't have any responsibility for loosing data or the other directly or indirectly failures.

1) When user or someone else do mistake to handle with SD memory card
2) When static electricity and the electrical noise influence the SD memory card
3) When SD memory card is removed or power supply of main unit turns off during the access LED is blinking on the main unit
   *We recommend that you always save an important data in other media to backup.

We recommend moving or deleting logging data in the folder created by KW1M-H regularly (every 1-month). When inserting SD memory card, delete the logging data in the folder created by KW1M-H.

When you turn off the Eco-POWER METER, remove the SD memory card first. If not, it might damage the Eco-POWER METER and SD memory card.

8.6.1 Demand power

Demand span	30 minutes span fix	
Span system	synchronized with the main unit clock (synchronized with the frequency of measured voltage) Clock correction; available / not available (selectable with setting mode)	
Data update cycle	1 minute	
Power input type	Current transformer (CT) input / Pulse input *1 (selectable with setting mode)	
Measurement item	Present demand (update every 1 second), Estimated demand (update every 1 minute)	
Display	Present demand, Estimated demand, Demand setting value Ratio of estimated demand Demand log, Monthly max. demand log, Max. demand	
Saved data (main unit memory)	Monthly max. demand log 13 records (13 months) Demand log 336 records (7 days)	
Demand alarm *2	Indication	[D] blinking on the upper line
	Output	1-circuit Pulse output (pulse output terminal)
Demand alarm stand-by time	1 to 30 min.	
Power Failure Memory	Monthly max. demand log, Demand log, Present demand, Max.demand	

*1 In order to use demand function by pulse input, input pulse with applicable pulse width according to 8.2.2 Pulse input. If other pulse is input, it doesn't work the demand function correctly.

*2 Demand alarm

When the present demand or estimated demand exceeds the setting value, it notifies by the output and the indication. You need to set 'DEM' with unit for pulse output setting in order to output.

*3 In case of a power failure, it stops monitoring demand and demand alarm (demand alarm off).

8.7 Self-diagnostic function

If an error occurs, the following indication will be given.

Indicator	Meaning	Output status	To recover
Err0	CPU error	OFF	Turn the power off and then on again.
Err1	Memory error*		EEPROM life ended. Replace the unit.

*Includes the possibility that the EEPROM's life has expired.

8.8 Power Failure Memory

Eco-POWER METER memories integrated electric power and working status to internal EEPROM until when power supply is off. (Power failure guarantee)

And every time to change each setting, each setting value is memorized to internal EEPROM at the same time. Therefore, change setting frequently makes EEPROM's life short. Avoid to usage like this.

*Especially be careful if you set by communication.

8.9 Applicable standard

Safety standard	EN61010-1		
EMC	EMI EN61326-1	Radiation interference field strength Noise terminal voltage	CISPR11 class A CISPR11 class A
	EMS EN61326-1	Static discharge immunity RF electromagnetic field immunity EFT/B immunity Surge immunity Conductivity noise immunity Power frequency magnetic field immunity Voltage dip / Instantaneous stop / Voltage fluctuation immunity	EN61000-4-2 EN61000-4-3 EN61000-4-4 EN61000-4-5 EN61000-4-6 EN61000-4-8 EN61000-4-11

8.10 Dedicated Current Transformer Specifications

●Clamp-on type

Model No		AKW4801C	AKW4802C	AKW4803C	AKW4804C	AKW4808C
Primary side rated current		5A / 50A	100A	250A	400A	600A
Secondary side rated Current		1.67mA / 16.7mA	33.3mA	125mA	200mA	200mA
Transform ratio		3000:1	3000:1	2000:1	2000:1	3000:1
Ratio error		±2.0% F.S.				
Hole Dia (mm)		ϕ10	ϕ16	ϕ24	ϕ36	
Breakdown voltage (initial)		AC1000V/1min (Between through hole and output lead wire)		AC2000V/1min (Between through hole and output lead wire)		
Insulation resistance (initial)		Min. 100MΩ (at DC500V) (Between through hole and output lead wire)				
Vibration resistance	Functional	10 to 55Hz (1 cycle/ minute) single amplitude of 0.15mm (10 min. on X,Y and Z axes)				
	Destructive	10 to 55Hz (1 cycle/ minute) single amplitude of 0.375mm (1 hrs. on X,Y and Z axes)				
Shock resistance	Functional	Min. 98m/s^2 (4 times on X,Y and Z axes)				
	Destructive	Min. 294m/ s^2 (5 times on X,Y and Z axes)				
Output protection level		±7.5V with clamp element		±3.0V with clamp element		
Permissible clamping frequency		Approx. 100 times				
Ambient temperature		-10 to +50℃ (without frost and non-condensing)				
Storage temperature		-20 to +60℃ (without frost and non-condensing)				
Ambient humidity		30 to 85%RH (at 20℃ non-condensing)				
Weight (with relay cable)		Approx. 60g	Approx. 90g	Approx. 200g	Approx. 295g	Approx. 450g

●Through type

Model No		AKW4506C	AKW4507C	AKW4508C
Primary side rated current		50A / 100A	250A / 400A	600A
Secondary side rated Current		16.7mA / 33.3mA	125mA / 200mA	200mA
Transform ratio		3000:1	2000:1	3000:1
Ratio error		±1.0%F.S.		
Hole Dia (mm)		ϕ17	ϕ36	
Breakdown voltage (initial)		AC1000V/1min (Between through hole and output lead wire)	AC2000V/1min (Between through hole and output lead wire)	
Insulation resistance (initial)		Min. 100MΩ (at DC500V) (Between through hole and output lead wire)		
Vibration resistance	Functional	10 to 55Hz (1 cycle/ minute) single amplitude of 0.15mm (10 min. on X,Y and Z axes)		
	Destructive	10 to 55Hz (1 cycle/ minute) single amplitude of 0.375mm (1 hrs. on X,Y and Z axes)		
Shock resistance	Functional	Min. 98m/s^2 (4 times on X,Y and Z axes)		
	Destructive	Min. 294m/ s^2 (5 times on X,Y and Z axes)		
Output protection level		±7.5V with clamp element	±3.0V with clamp element	
Ambient temperature		-10 to +50℃ (without frost and non-condensing)		
Storage temperature		-20 to +60℃ (without frost and non-condensing)		
Ambient humidity		30 to 85%RH (at 20℃ non-condensing)		
Weight (with relay cable)		Approx. 70g	Approx. 200g	Approx. 215g

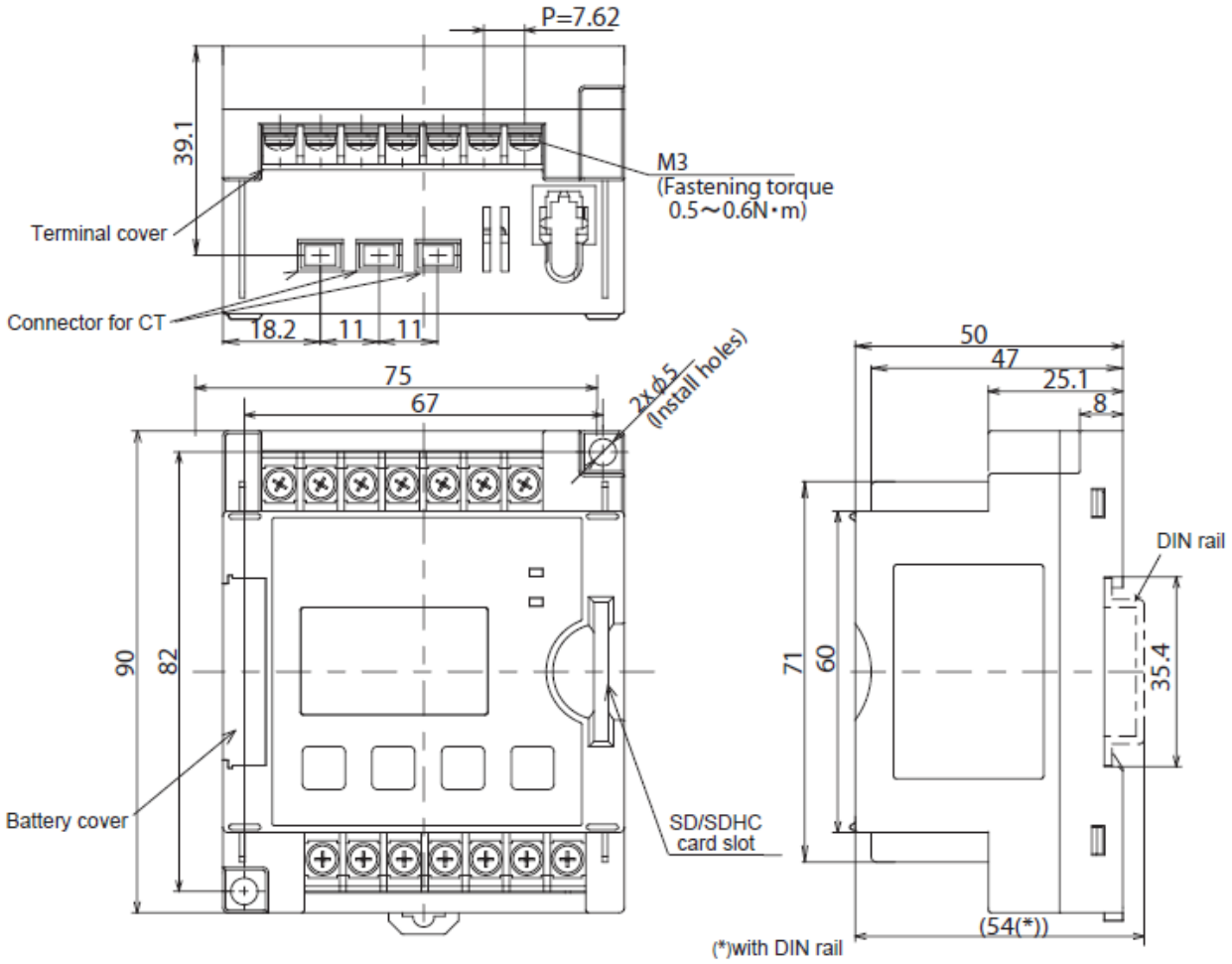
Note) Dedicated current transformers (CT) are dedicated for low voltage under 440V. They can not be used for high voltage circuit. In case measuring high voltage circuit, make a 2-step construction by combination of a commercial CT of secondary side current 5A for high voltage and the dedicated CT for 5A.

Chapter 9 Mounting

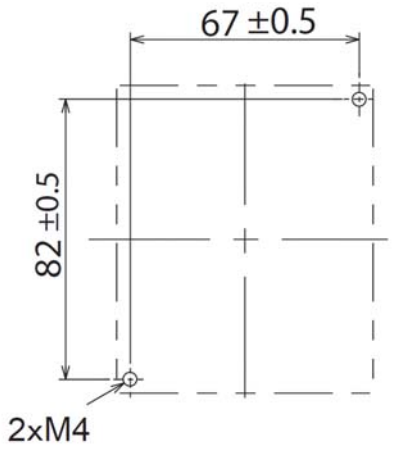
9.1 Dimensions

9.1.1 Main unit

(unit: mm)



Panel cutout

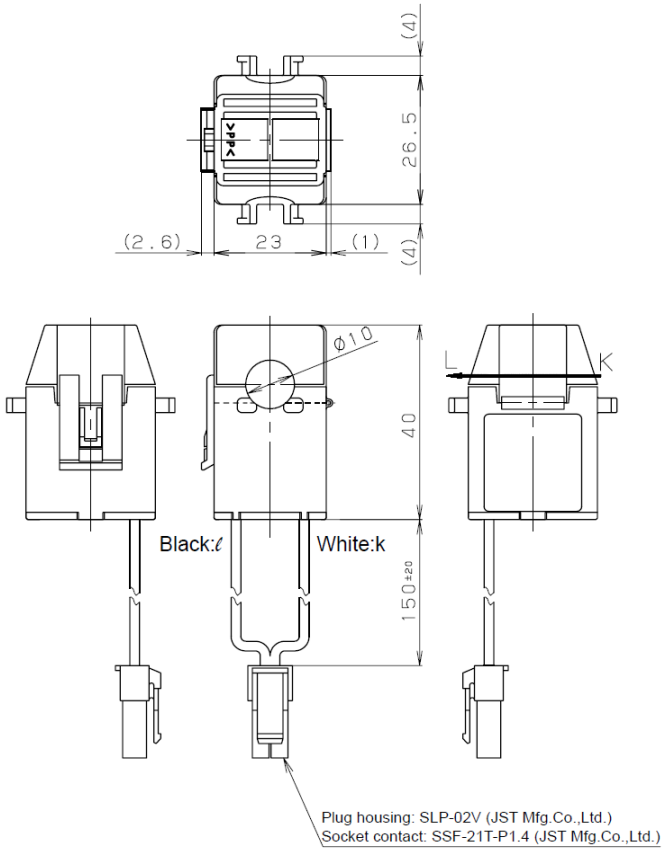


Please keep space that the thumb enters for the battery exchange at the left of the main unit (about 30mm).

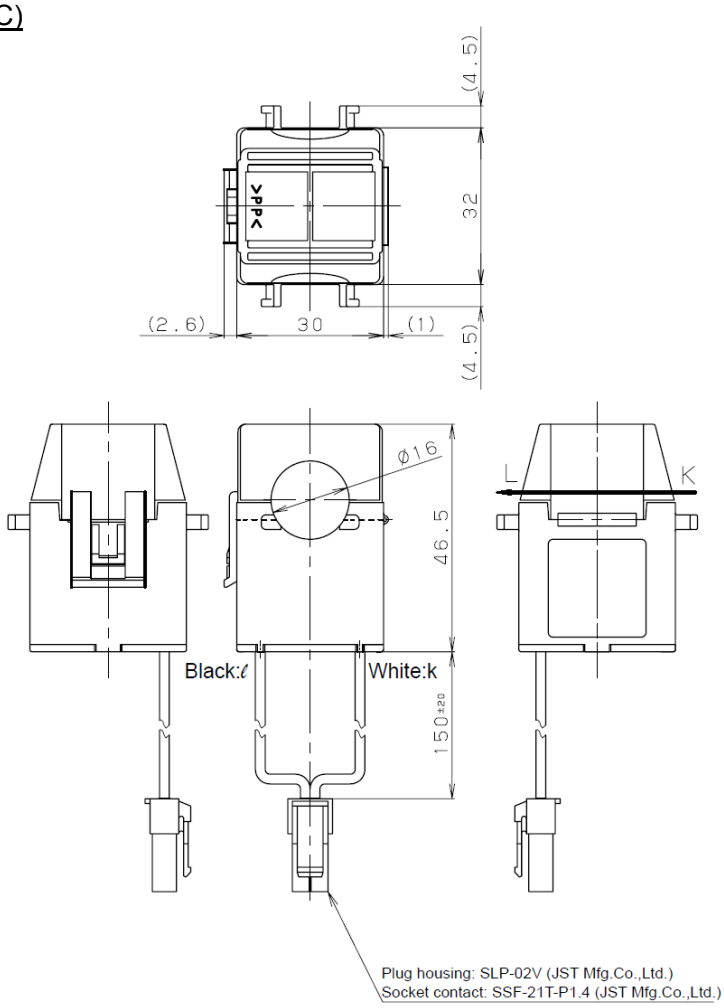
9.1.2 Dedicated CT

(unit: mm)
(tolerance: ±1.0)

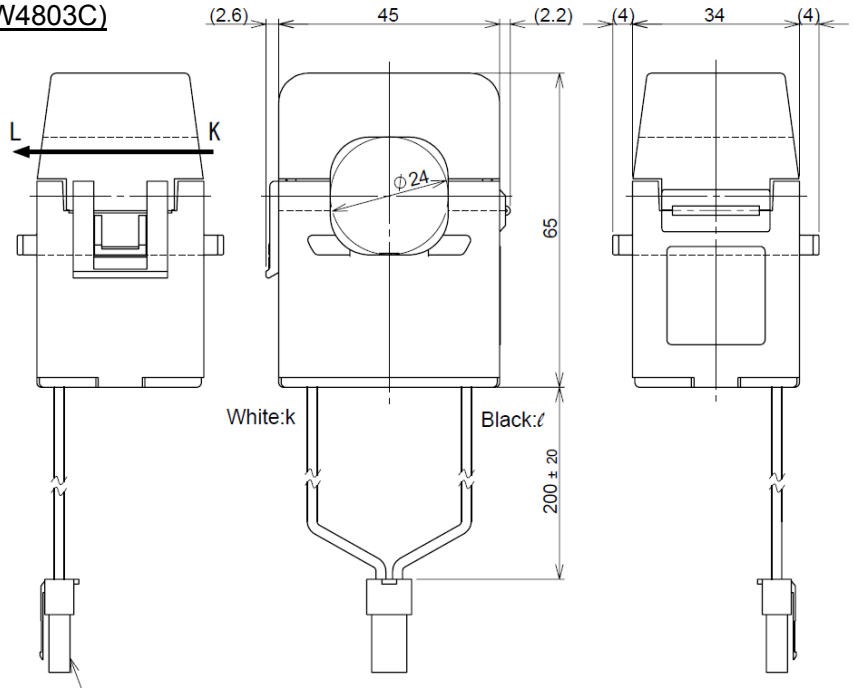
◆For 5A/50A (AKW4801C)



◆For 100A (AKW4802C)

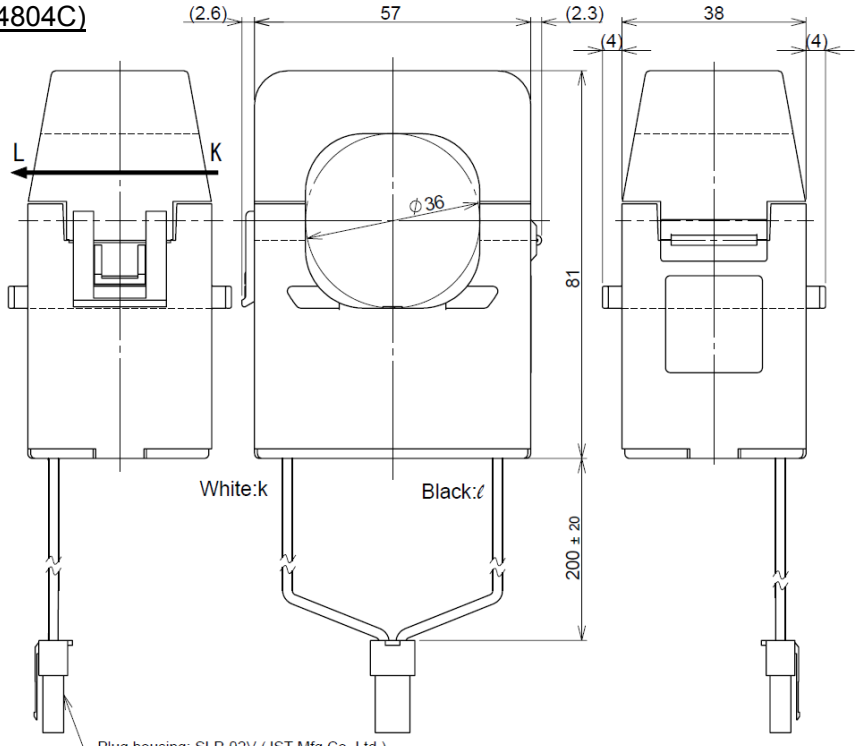


◆For 250A (AKW4803C)



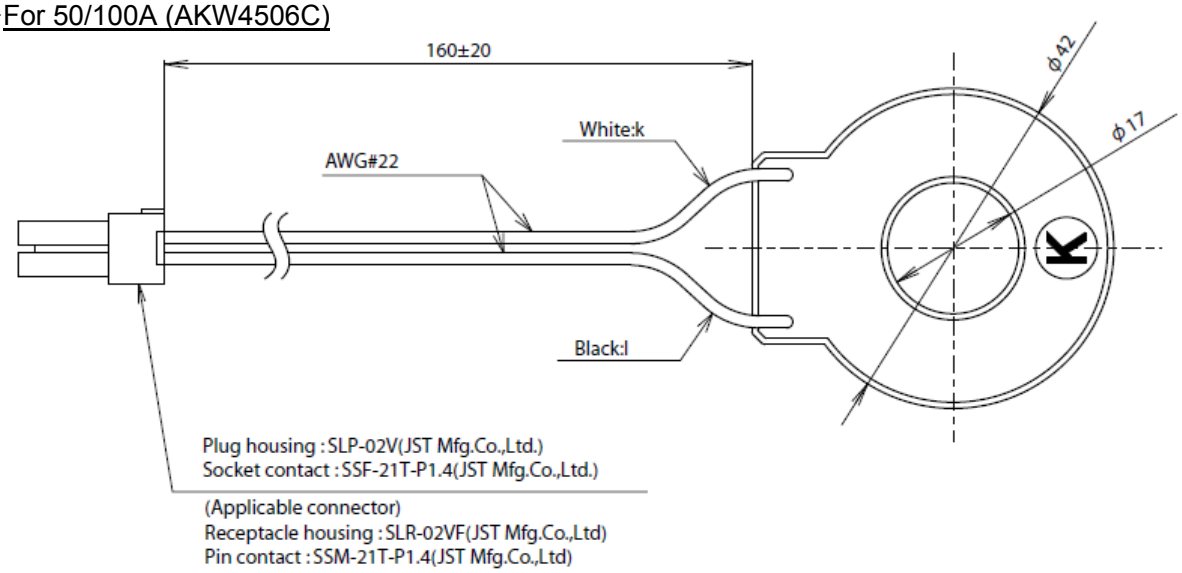
Plug housing: SLP-02V (JST Mfg.Co.,Ltd.)
Socket contact: SSF-21T-P1.4 (JST Mfg.Co.,Ltd.)
(Applicable connector)
Receptacle housing: SLR-02VF (JST Mfg.Co.,Ltd.)
Pin contact: SSM-21T-P1.4 (JST Mfg.Co.,Ltd.)

◆For 400A (AKW4804C)

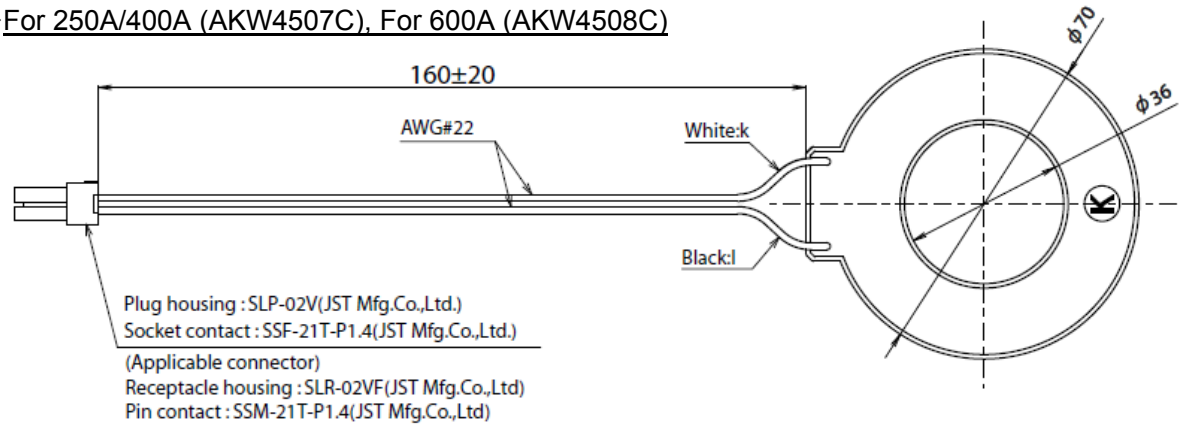


Plug housing: SLP-02V (JST Mfg.Co.,Ltd.)
Socket contact: SSF-21T-P1.4 (JST Mfg.Co.,Ltd.)
(Applicable connector)
Receptacle housing: SLR-02VF (JST Mfg.Co.,Ltd.)
Pin contact: SSM-21T-P1.4 (JST Mfg.Co.,Ltd.)

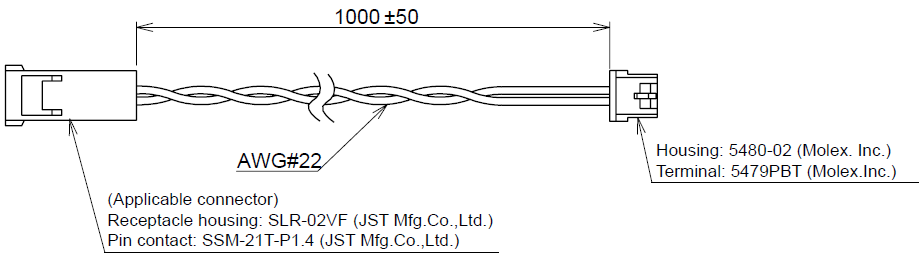
◆For 50/100A (AKW4506C)



◆For 250A/400A (AKW4507C), For 600A (AKW4508C)

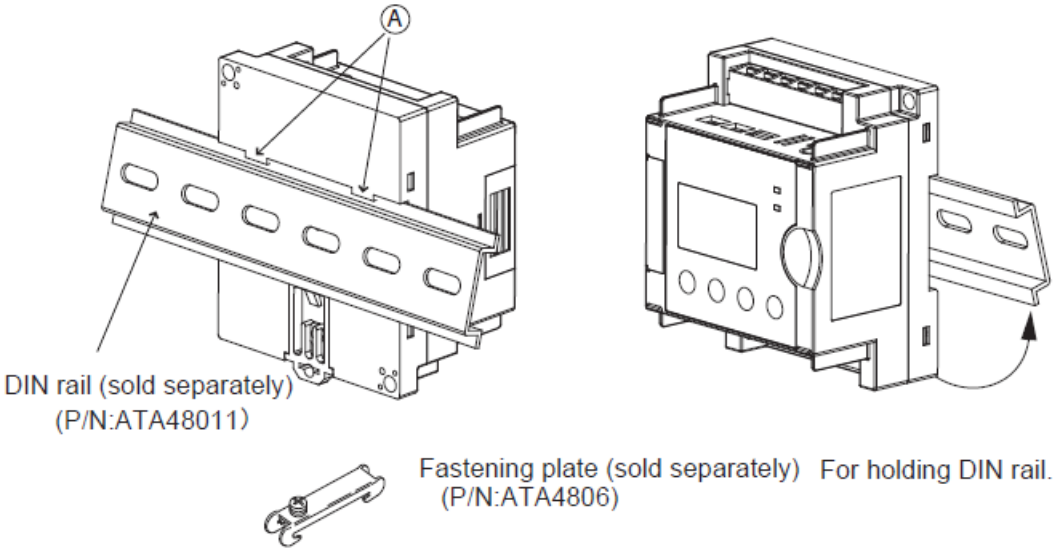


◆Attached trunk cable (common)



9.2 How to mount to DIN rail

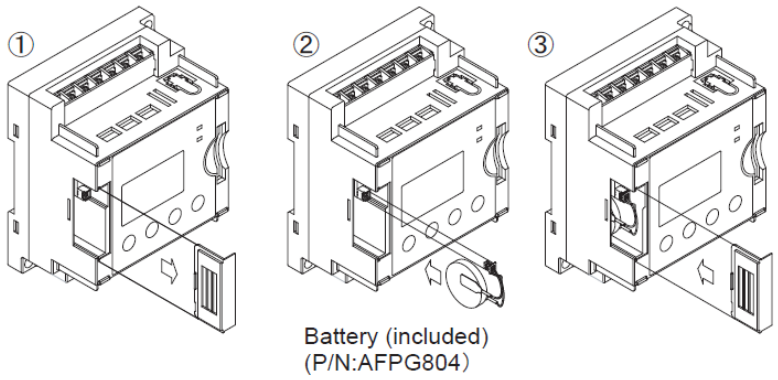
(1) Hook ‘A’ of main unit on the upper side of DIN rail.
(2) Making ‘A’ part as a support fit the bottom side of main unit to DIN rail.
(3) It will be completely fixed to DIN rail with a ‘click’ sound.



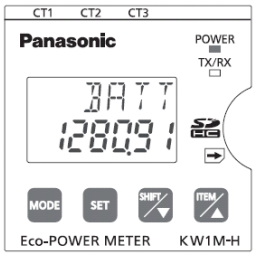
9.3 How to connect / replace the battery

Be sure to connect the battery included before using the unit.
When starting to use the unit first or passing long time with battery off or changing the setting for power input type and calendar, initialize the memory by memory initialize mode (Mode4).
If you don’t initialize it, it doesn’t log correctly.
And set the current time by calendar timer setting mode in order to use logging function.

(1) Remove the battery cover.
(2) Insert the connector and put into the case.
(3) Put the battery cover in.



Battery life is about 2 years; we recommend exchanging battery about 2 years from the beginning of the use. When battery has abnormal or battery power is reduced, ‘BATT’ is blinking in the lower line. Please replace the battery according to the procedures in 1 minute.
In addition, be sure to save logging data in SD memory card before replacing battery. It may lose the internal memory. When replacing, remove connector after taking from the case.



After replacing the battery, be sure to initialize the unit memory before using. (Refer to MODE4)

<Note>
Please throw away the replaced battery according to the instruction of your area.

Chapter 10 Q&A

■Hardware

Q1	I'd like to measure by Eco-POWER METER. Measured load is 50 to 60A in normal operation. But the inrush current is 130 to 140 A. Which CT is selected? (100A or 250A)
A1	Select 100ACT. Stable current more than 1 second is necessary to measure. The inrush current seems to be a few ms, therefore it can't measure it. In case there is current over 1 second (inrush current), it measures it and select 250A CT.

Q2	Current and voltage are displayed. But it can't measure an electric power.
A2	・Do you install CT to the correct position and correct direction? CT has directions. Install CT according to the direction marked. From power supply side (K) to load side (L). ・Do you wire measurement voltage input correctly? When phases of voltage and current are not matched, it can't measure correctly. Please check the wiring.

Q3	How long do I extend CT cable?
A3	You can extend up to about 10 m with cable of AWG#22 or more. We can't guarantee the specifications if you extend more than 10m.

Q4	How do you guarantee the accuracy of measurement with low current range?
A4	Up to 5% for CT rating. In case of CT50A, for an electric power with current 2.5A or more, the accuracy is ±2.0%. (For PF=1)

Q5	'BATT' is displayed.
A5	It is notice to reduce battery. Do you connect battery attached? If the battery is connected, it is time to replace. Replace to new battery.

■Measuring data (SD memory card)

Q6	How much is the capacity to write at once?
A6	Max. 1MB

Q7	How much does it use capacity one day when SD memory card is always inserted?
A7	About 210kB for 1 day with log cycle 1 min of file type 3.

Q8	I open csv file by Excel, and the data is not displayed.
A8	It is the problem with only Excel setting. Extend the width.

Q9	I can not take data with the setting cycle.
A9	You can set log cycle only with file type 3. Log cycle for type 1 and type 2 is fixed to 1 hour. Please check csv file for type 3.

Revision History

Issue Date	Manual no.	Content of revision
January, 2010	ARCT1F497E	First edition
January, 2012	ARCT1F497E-1	2nd edition [Add functions] 600A CT input Add through type CT Update SD memory card spec [Improve spec.] Improve the accuracy [Correct error] VT wiring
March, 2012	ARCT1F497E-2	3rd edition [Add functions] Simple demand function [Change specs.] ・Main Unit memory specifications, Logging Function, File type 3, Saved data amount Max. 5760 records about 4 days
March, 2013	ARCT1F497E-3	4th edition [Add function] Ver.1.20 ・Enforcement the demand function Add setting items for mode 2 Change time setting range (add second) ・Add logging data items for file type 3 ・Add display items, electric power converted by pulse and maximum demand.

Please contact .....

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Specifications are subject to change without notice.

ARCT1F497E-3